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JUNE 11, 1984

CHEMICAL & ENGINEERING

NEWS

PRELIMINARY PROGRAM
ACS Philadelphia meeting
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Facts & Figures

for the chemical industry

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Cover: Sharon H. Wolfgang

CHEMICAL & ENGINEERING NEWS

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JUNE 11, 1984

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■ **Du Pont priming for a major expansion of its waste treatment services.** **Page 7**

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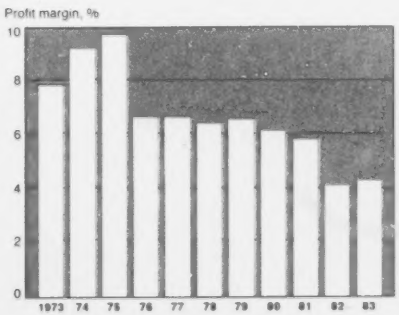


Facts & Figures

1983 was a recovery year for the U.S. chemical industry as economic improvement led to expanded production. **Page 32**

Recovery Slows For Large-Volume Acids

Sulfuric and phosphoric acids may be entering period of 4% or so annual growth in late 1980s, with overcapacity becoming commonplace

Bruce F. Greek, C&EN Houston

Producers of the two major-volume mineral acids—sulfuric and phosphoric—are beginning to see that 1984 will not be nearly so strong a year as was originally forecast. With the year half gone, and the first half traditionally the better half because of the spring fertilizer season, results have been disappointing. Now, according to more realistic forecasts resulting from first-half results, the rest of the decade could be one of a shift from past trends.

Production of sulfuric and phosphoric acids will be up 8% or so in 1984. Although that falls below most producers' expectations, it may seem high compared to rates now talked about for the rest of the 1980s. Forecasters aren't discounting the possibility of more recessions in the decade, which could affect demand for these acids—especially sulfuric. And recoveries could produce large gains over the recessions, as has happened recently. But a smoothed curve through the late 1980s could show annual production growth rates of 4% or less.

With these kinds of annual growth rates forecast now, producers of these acids face a continuation of low average plant operating rates. The rates will rise slowly from current levels, assuming the dearth of plans for plant expansions also continues. But it will be a long time before operating rates will approach 100% of nameplate capacity, much less surpass it as has happened in the past for phosphoric acid.

About the only plant expansions expected for sulfuric acid are those that result from the need to do something with the sulfur dioxide produced in smelting operations to meet air pollution control rules, or those of the debottlenecking type as part of efforts to improve efficiencies. Expansion of phosphoric acid plant capacity, if any, would be to make wet-process acid as the result of some unexpected rise in demand for fertilizers, either domestically or for world export markets.

Key Chemicals

It could be a long time before capacity currently shut down is reactivated, if it ever is. Usually producers of phosphoric acid prefer to run plants above the nameplate level for short periods during high demand for fertilizer products rather than to start up other units for just a short time. Sulfuric acid plants, if fully shut down, rust quickly, making restart of a plant expensive and unlikely if it is old.

Financial incentives are there for both plant shutdowns and delay of capacity additions. Prices of both sulfuric and phosphoric acids have improved during 1983 and early 1984. A good part of the price improvement, however, results from a pass-through of increased sulfur prices. The real price increases after discounting have not been large enough to provide sufficient return on investment to make additions or in some cases to retain plants.

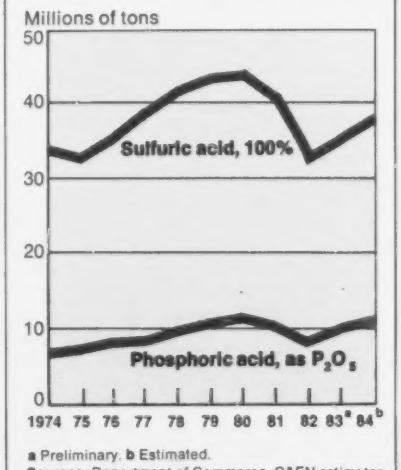
Just as production volumes are not yet back to historical highs, neither are sales. A peak in production occurred in 1980 when 44 million tons of sulfuric acid and 11 million tons of phosphoric acid (measured as P_2O_5) were made. This year, even with the economic recovery, sulfuric acid production will do well to reach 37.5 million tons. Phosphoric acid will almost reach the previous high at 10.8 million tons of P_2O_5.

The value of production of the two acids in 1984 will total about $4.5 billion, still well down from the value in 1980 of about $5.25 billion. No adjustment for inflation is included, so producers' incomes are even relatively lower.

Of the two acids, sulfuric suffers more. It accounts for more of the decline in production and sales values. That's what might be expected for a product with the greater overcapacity. This year production of sulfuric acid will represent less than two thirds of installed capacity.

For details of the near-term outlook for sulfuric and phosphoric acids, please see the following pages.

Output of big acids up, but remains below 1980 high



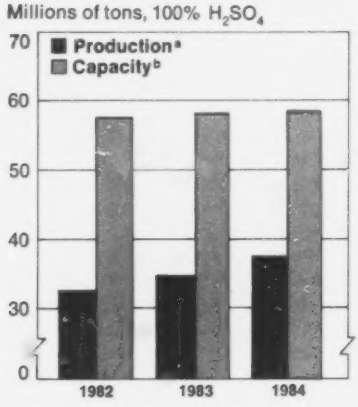
a Preliminary. b Estimated.
Sources: Department of Commerce, C&EN estimates

Sulfuric acid

H_2SO_4

- ***Demand growing***
- ***Capacity up slightly***
- ***Prices discounted***

PRODUCTION/CAPACITY



a From all sources. b First quarter.

HOW MADE

Sulfur dioxide made by burning sulfur or recovered from smelting, oxidized, and reacted with water

MAJOR END USES (U.S.)

Fertilizer manufacture 70%; chemical manufacture, metals processing, petroleum refining 5% each

FOREIGN TRADE

Exports—could fall below 250,000 tons in 1984, imports—could exceed 500,000 tons in 1984

PRICES

List prices, virgin acid, $55 to $90 per ton, depending on location; smelter acid, $20 to $50 per ton; discounting remains heavy.

COMMERCIAL VALUE

$2 billion for estimated production, 1984

Production of sulfuric acid continues its plodding recovery. In fact, the annual increase in production of this workhorse of the chemical industry during 1984 will be greater than 1983's increase. But it will be several more years before production reaches the level experienced in 1980.

Industry sources expect 1984 sulfuric acid output to rise 8 to 9% over 1983's to about 37.5 million tons (measured as 100% sulfuric acid). That amount would be 15% above 1982 production, which was the lowest for any year since 1975.

After 1984, production growth for sulfuric acid will slow down, perhaps leveling off at a rate of less than 3% per year. Hence, with average growth rates such as these forecast through this decade, a return to production greater than the 44 million tons produced in the record year of 1980 will take quite some time. Breaking through the 44 million ton-per-year level thus might not happen until 1990, if forecasts of slow growth prove accurate.

Installed capacity to make sulfuric acid far exceeds not only current production but also any forecast levels of output. Considerable sulfuric acid capacity now is idle and more is expected to be shut down between now and 1990. However, it is difficult to obtain a good fix on operable capacity because sulfuric acid plants are shut down and allowed to rust before officially being scrapped.

Including those facilities shut down, but not scrapped, operating rates of sulfuric acid plants during 1984 likely will average about 65% of installed nameplate capacity—better than the 60% rate in 1983 and the 57% rate in 1982, but not much. And, of course, actual rates are higher, considering that the shut-down plants are still included in the figures. But sulfuric acid producers, though not liking it much, have grown to accept low average operating rates. They will operate a plant at very low levels to keep the units warm. This minimizes corrosion and keeps it available should demand surge.

During the first and fourth quarters of a year, production runs much higher than the yearly average for sulfuric acid plants as producers work to meet demands for making phosphoric acid for fertilizers. Later, in the spring and summer, plants are run at much lower rates and some acid is moved into nonfertilizer markets if they are available. All these factors also make forecasts of operating rates difficult.

For many years to come, new capacity to make sulfuric acid will be limited largely to that needed to meet pollution control requirements, mainly at smelters. The current view for other production facilities is that enough capacity exists to meet any demand that could possibly come from any of the major uses of sulfuric acid. Only an unusual situation would cause a producer to build a plant to supply sulfuric acid for making phosphate fertilizers, for refining, or for any of the many merchant demands.

Sulfuric capacity to be shut down and scrapped will be of many types. Most in danger will be those units using smelter gases if it becomes clear that the smelter itself will be shut down. This could happen for a number of reasons, such as an uneconomic ore supply. Less clear is the future of sulfuric acid plants at fertilizer complexes. These are a wide mixture of new and old units with the usual variations in efficiency and depreciated value that can affect decisions on whether producers will keep them operating or not. Sulfuric acid facilities that generally supply merchant markets seem to be under pressure because of significant declines in demand for downstream products.

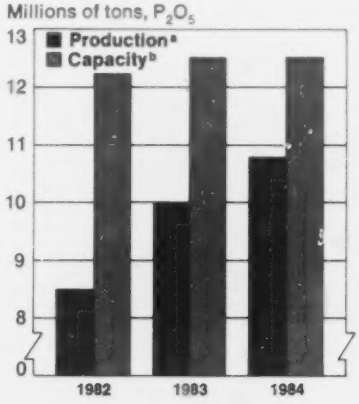
As in the past, sulfuric acid going to make fertilizers of one kind or another dominates consumption, making up more than two thirds of the total. The outlook for fertilizers depends on many factors ranging from weather to politics, with economics often taking second place. In 1984 and 1985, fertilizers are accounting for their proportional share of the increase in demand for sulfuric acid. Demand for fertilizers has not come up to most expectations this spring, even with the end of the payment-in-kind program. Inventories are being built again and hopes are pinned on good movement of fertilizers this fall. If that happens, then the demand for sulfuric acid in 1984 could meet present forecasts—but only with a strong fourth quarter.

Phosphoric acid

H_3PO_4

- *Demand up again*
- *Capacity on hold*
- *Prices discounted*

PRODUCTION/CAPACITY



a From all sources. b First quarter.

HOW MADE

Reaction of phosphate rock with sulfuric acid; burning of elemental phosphorus and subsequent reaction with water

MAJOR END USES (U.S.)

Fertilizers 85%, detergent materials 5%, food and feed materials 5%

FOREIGN TRADE (as acid)

Exports—slumping to about 700,000 tons of P_2O_5, imports—tiny, possibly about 25,000 tons of P_2O_5

PRICES

List prices about $300 per ton of P_2O_5, discounts heavy

COMMERCIAL VALUE

$2.5 billion for estimated production, 1984

"It's not as we hoped, nor even as we expected." In this way, one industry source summarizes the current slowdown in phosphoric acid demand, which counters earlier expectations for sizable growth in 1984. These expectations, formed last fall, were based on such factors as the end to the government's payment-in-kind (PIK) crop set-aside program, higher prices for farm commodities, and increased exports.

Although PIK has ended for practical purposes, the expectations have gone awry. Commodity prices, though up somewhat, remain below most farmers and fertilizer producers' forecasts. Thus, domestic phosphate fertilizer demand is less than expected. The strong dollar continues to dampen exports of phosphate fertilizers.

These are the other important reasons why 1984 production of phosphoric acid will do well to be up 8% to 10.8 million tons (measured as P_2O_5). Production in 1983, still a preliminary estimate, was up more than 17% from 8.5 million tons in 1982, the lowest annual production since 1976.

Most phosphoric acid produced in 1984 will be wet acid, made by acidulating phosphate rock with sulfuric acid. However, about 7% or less of total production, or about 700,000 tons as P_2O_5, will be made from elemental phosphorus produced in electric furnaces—furnace acid. This 10.1 million tons of wet acid now seems dependent on developments this fall in fertilizer demand after most of the harvest is in. If crop yields, particularly corn, are good and farmers' receipts are better, then some pickup in fertilizer production to build inventory for the spring season will occur.

As it stands now, estimates of the 10.1 million tons include some 300,000 to 400,000 tons of wet acid output going into phosphate fertilizer inventories. Inventories have been built up some this spring as fertilizer demand fell below anticipation. As a result, some production plants are expected to be shut down two to four weeks earlier than usual for maintenance and vacations. The size of the inventories overhanging the potential fall market is not clearly known yet, but it could be up more than preliminary estimates show. The inventories could lead to an unfortunate return to the surpluses that were worked off at the expense of profits during 1982 and 1983.

The rest of the phosphoric acid production is expected to be consumed as various fertilizers or exported as the acid, 9.0 million to 9.3 million tons; as animal feed materials, about 500,000 tons; and other uses, mainly detergent materials, some 100,000+ tons. Clearly then, more than 90% of all wet-process phosphoric acid goes into fertilizers directly, or for export and subsequent manufacture into fertilizers. So fertilizers dominate phosphoric acid. How fertilizer demands are influenced by weather, farm politics, exports, and other nonagronomic factors quickly reflects back to phosphoric acid manufacture.

Capacity to make phosphoric acid has leveled off at about 12.5 million tons of P_2O_5. All but about 750,000 tons are wet-process acid plants. Both wet-process and furnace acid plants are shut down. Some have been down for quite some time and may never restart. Counting these questionable plants as still potential capacity, the operating rate likely will average above 85% for all of 1984.

This spring, for example, weather again has been a strong factor in fertilizer demand resulting in earlier than usual shutdown of some plants. Rains have slowed field work. Consequently, planting is being hurried with the result that at a significant number of farms, initial fertilizer application will be passed up—especially in the case of corn—for a later side dressing with nitrogen. This will work to the detriment of phosphorus use.

Exports of both phosphoric acid and fertilizer derivatives such as diammonium phosphate are expected to be down this year. The strong dollar continues to hamper exports as do the large debts from buying oil being run up in developing countries.

On balance, producers of phosphoric acid will have a better year, but not so good as had been hoped. It will not be so good in terms of plant operating levels as in some past years. This development of unexpectedly lower operating rates has begun to put some pressure on prices, keeping profitability low.

Product sales buoy biotechnology revenues

Moving swiftly toward commercialization, companies in the biotechnology field reported sharply higher revenues for the first quarter of 1984. For a dozen biotechnology-based firms, composite revenues were 77% higher than those in the corresponding 1983 period.

Most significant, product sales have begun to constitute a noticeable portion of a revenue mix that previously had consisted nearly exclusively of R&D contract fees and interest income. On many income statements, product sales appeared for the first time, and, on some, made up the fastest-growing component of revenue.

At Genex, for example, which is producing L-phenylalanine for G. D. Searle & Co.'s aspartame, product sales rose to $3.8 million—63% of operating revenues—from nothing in the year-earlier quarter. Monoclonal Antibodies attributed most of its 241% revenue increase to sales of its line of pregnancy-detection kits. At Molecular Genetics, sales of the company's first product—a monoclonal to prevent calf scours—made up a third of operating revenue compared to less than 1% a year before.

It is true, on the other hand, that product sales still make up little or no part of revenue at such major companies as Genentech, Cetus, and Biogen. Nevertheless, the deduction that there is a widespread, ongoing metamorphosis from R&D operations to integrated manufacturing companies—a shift predicted by many analysts—appears indisputable.

At the same time, earnings remain negligible or nonexistent as companies continue to plow revenues back into R&D, staff increases, and plant construction. For most biotechnology-based firms, the presence or absence of net income appears to have less to do with corporate health than with how much speed and independence they want to maintain.

Biogen, for instance, nearly doubled its first-quarter loss, despite raising revenues 49%. "Our net loss is in keeping with our strategy of using our financial resources to accelerate product development," chairman Walter Gilbert said.

Other deficit-reporting firms had similar explanations. And those companies with profits were equally anxious to put the bottom line in this special context. "The company is intentionally operating at a modest income level as we concentrate our resources toward early market entry," said Genentech president and chief executive officer Robert A. Swanson.

David Webber, New York

Biotechnology revenues increased in first-quarter 1984

	FIRST-QUARTER 1984[a]					
	Operating revenue[b]	Total revenue	Operating revenue as	Earnings[c]	Change from 1983	
	($ millions)		% of total	($ millions)	Revenue	Earnings
Biogen	$4.17	$ 6.03	69.2%	$−3.63	49%	def
BioTechnica International	na	0.40	na	−1.05	740	def
Biotechnology Development	0.26	0.34	78.6	−0.10	367	def
Centocor	na	2.53	na	0.01	97	nm
Cetus	9.40	12.03	78.1	0.11	38	−58%
Damon Biotech	0.76	1.40	54.6	−0.62	153	def
Genentech	na	15.29	na	0.39	56	67
Genex	5.40	6.00	90.0	−1.70	275	def
Hybritech	na	6.06	na	0.14	97	nm
Molecular Genetics	1.94	2.61	74.1	−0.06	126	def
Monoclonal Antibodies	na	0.78	na	−1.09	241	def
Ribi ImmunoChem	0.15	0.23	62.5	−0.07	53	def

a For January–March 1984 period, in general. Companies have various fiscal years. b Includes revenue from R&D contracts, product sales, and royalties, but excludes interest income. c Excludes extraordinary credits. def = deficit. na = not available. nm = not meaningful. **Source:** Company financial statements

Du Pont licenses line of ultracentrifuges

Du Pont is a company known for generating new products internally, but one aspect of the firm's current push into emerging businesses in life sciences and electronics has been an apparently increased willingness to use acquisitions, licensing agreements, and academic research arrangements to advance its product development.

The acquisitions of New England Nuclear and Solid State Dielectrics and a research deal with Harvard medical school are recent examples of this trend. Now the company has moved to bolster its clinical instrument business with a license to market in the Western Hemisphere a line of ultracentrifuges manufactured by Kontron, a Swiss subsidiary of Hoffmann-La Roche. Eventually Du Pont expects to assemble the instruments in the U.S. and, ultimately, manufacture them here. The diagnostic and bioresearch systems division of the company's nine-month-old biomedical products department will handle the line.

The computerized ultracentrifuges, seen by Du Pont as a direct thrust at Beckman Instruments' dominance of the $50 million global market, are part of the company's effort to tap into the burgeoning bioresearch field with state-of-the-art separation technology and instrumentation. Though the ultracentrifuges are not a particularly large market, they jibe with the company's plan to expand its position in the bioresearch field with a series of relatively small products while waiting for the biomedical products department to generate a "home run ball," something that will take time, remarks Donald C. Sutherland, director of the diagnostic and bioresearch systems unit.

Sutherland points out that the licensing deal does not indicate a reduction of in-house R&D. Instead, he says, it is a way to avoid duplication of effort in technology development. "It could be the forerunner of other such arrangements," he says. □

Study Indicates Some Improvement In U.S. Science Education

Counter to trends in recent studies, new survey shows improved overall science scores among fifth and ninth graders, compared to 1970's

James H. Krieger, C&EN Washington

Preliminary analysis of the Second International Science Study (SISS), sponsored by the International Association for the Evaluation of Educational Achievement, is starting to yield results—and they run counter to the current conventional wisdom.

In short, the results show that U.S. school children know more about biology and physical science today than school children did in 1970—although they know less about space travel.

"There is a richness of rhetoric but a dearth of empirical data about science education in our schools," says Willard J. Jacobson, professor of natural sciences at Teachers College, Columbia University, and national research coordinator for SISS. If preliminary findings hold up in subsequent analysis, Jacobson sees the study providing evidence that U.S. science teachers "are doing something right," despite the recent spate of reports critical of education in the U.S.

Recent criticism of U.S. science education has been based heavily on results of studies by the National Assessment for Educational Progress and on declining scholastic aptitude test (SAT) scores. Jacobson admits the SAT data aren't easily explained away, but he feels the NAEP data can and have been misinterpreted.

In any event, educators will soon have the SISS data to ponder. The preliminary results were presented recently by Jacobson and his colleagues at the annual meeting of the American Association for the Advancement of Science, held recently in New York City.

The current data are based on testing for SISS that took place during 1983 in public and private schools. Almost 5000 school children—2909 in fifth grade and 1958 in ninth grade—were tested in more than 200 schools. Overall science achievement increased 6.5% for fifth-grade students and 5.2% for ninth-grade students, compared to results of the First International Science Study conducted in 1970. The only questions that received fewer correct answers from both grades in 1983 related to the moon—one asking how long a rocket trip to the moon would last and the other asking for the source of sunlight.

C&EN staff photos

Jacobson: evidence that U.S. science teachers are doing something right

For fifth graders given 26 questions appearing in both studies, students in 1983 were less likely to know that a ball falls to the ground because it is pulled by Earth, but better able to read a thermometer and correlate their readings with data presented in a chart. Also in 1983, more fifth graders knew that a person's pulse and breathing rate

Second International Science Study testing shows variable achievement

Grade 5	
Correct answers (total test)	58.7%
Correct answers (biology items)	62.1%
Correct answers (physical science items)	55.7%
Average (mean) total score on 48 items	28.2
Low score	6
High score	46
Standard deviation	7.8

Grade 9	
Correct answers (total test)	61.4%
Correct answers (biology items)	64.7%
Correct answers (chemistry items)	54.0%
Correct answers (physics items)	61.3%
Correct answers (Earth science items)	61.1%
Average (mean) total score on 60 items	36.8
Low score	7
High score	59
Standard deviation	9.6

would increase during a 50-meter race.

For ninth graders given 33 questions appearing in both studies, students in 1983 were better able to read a graduated cylinder and select a drawing of an electrical circuit most likely to be in a box described by data in the question. They had trouble with some factual questions. For example, fewer, though most, children tested knew that the heart was not in the abdomen and that the sun was the source of energy for photosynthesis.

SISS associate national research coordinator Rodney L. Doran of the State University of New York, Buffalo, points out that the only statistical analysis of students carried out so far relates to the effect on achievement of gender and strata (public or private school). The results for the fifth grade, he says, are easy to interpret and are consistent with previous science education research. There is a significant effect favoring males, a significant strata effect favoring private schools, and no significant interaction among these variables.

The results for ninth grade, Doran says, are more complex. There is a significant gender effect favoring males. However, the strata effect isn't significant. Further, there is a significant interaction effect as a result of females from the private schools surpassing their male cohorts. Doran says further analyses will attempt to explain this "intriguing effect."

In addition to the tests, students were given questionnaires and opinionnaires. For example, an opinionnaire asked students to react to statements concerning science, school, and the study of science—for instance, "The science taught at school is interesting." And a science learning activities questionnaire asked students to report the frequency with which they engaged in various science learning activities—for example, the frequency that "the students themselves do experiments as part of the science lessons."

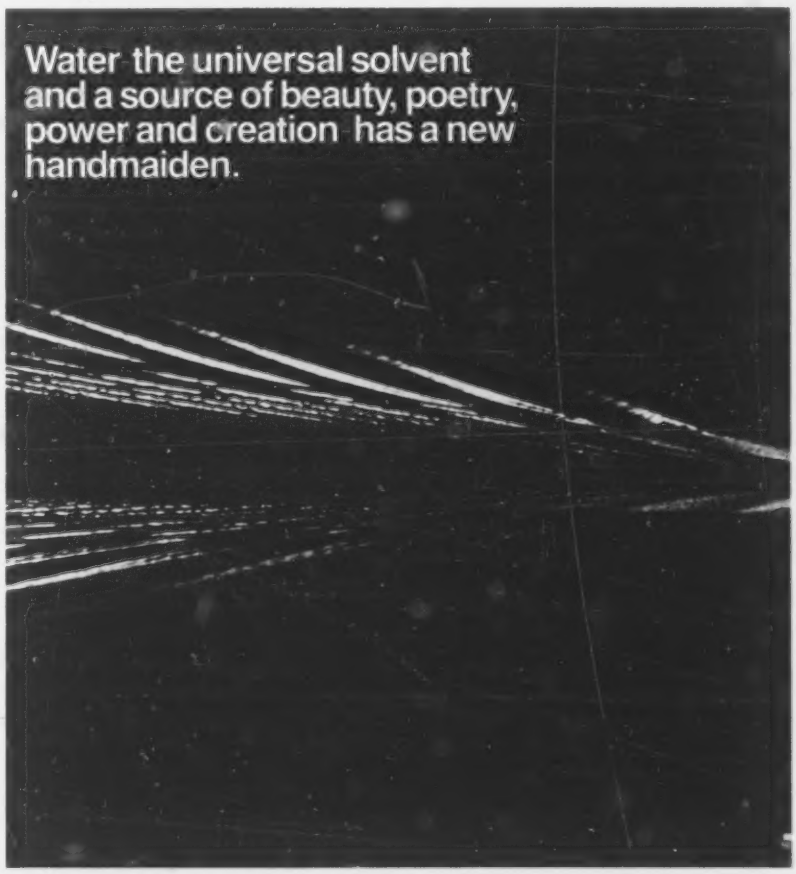
Doran notes that a number of anomalies exist in the data that need further investigation. Ninth graders, he says, find science both less enjoyable and less interesting than fifth graders. Yet, their enjoyment of school is about the same, although educational aspirations decrease in the ninth grade. At the same time, there is an increase in the use of small groups and student participation in science activities in the ninth grade. These findings, Doran says, aren't consistent with the gains in achievement on items assessing higher thinking skills. Jacobson expects to have results for SISS from testing of 12th-grade students—those in physics classes and those not studying any science—this fall.

The test items and questionnaires for SISS evolved through a rather elaborate process. Among other elements, a science curriculum case study was prepared by each participating country. The case study for the U.S., for example, describes the demographics of science education in the U.S., patterns of science offerings, goals for science education programs, objectives in science education programs, methods used in developing curricula, and topical outlines of science content areas.

A part of this activity involved ratings of U.S. science curricula, in which knowledgeable science educators were asked to make judgments

Students show improvement on identical "bridge" items

Average test score, %	Grade 5 Number of items	Grade 5 1970	Grade 5 1983	Grade 9 Number of items	Grade 9 1970	Grade 9 1983
Biology	9	49.7%	58.9%	10	59.9%	65.6%
Physical science	17	59.3	64.4	23	51.9	56.8
Total	26	56.0%	62.5%	33	54.3%	59.5%



Doran: the effect of science education in the 1970s has been positive

about the extent of coverage and degree of emphasis of the various content areas at each of the grade levels. The ratings were quantified by asking participants to rate on a scale from 0, indicating the content area was not included in curricula, to 3, indicating a high level of coverage with major emphasis for all or most students. Ratings were made for traditional science areas, such as chemistry and physics, as well as for nontraditional areas, such as environmental science and history and philosophy of science. One finding: Chemistry generally receives less coverage and emphasis among traditional science areas than do physics, biology, and Earth sciences.

The analyses of curricula were used in preparing items and questionnaires for trial testing, the results of which were used in further refining the testing materials. But Jacobson expects the curricular analyses to be of considerable value in their own right, representing as they do an extensive survey of the science education literature, local science programs, and the most widely used science textbooks, as well as the ratings of curricula.

The sample for testing was provided by the National Center for Educational Statistics. It drew up a representative sample of about 250 schools at each grade level, stratified on the basis of public and private schools. Since some schools had grades at more than one of the levels, the total sample was 521 public and 47 private schools, representing about 87,000 public elementary/secondary schools and 19,600 private schools. For grade five, 50% of available schools participated, although for grade nine, only 36% of available schools did.

A question raised by such testing is how representative the sample is of the nation as a whole. Doran points out that various analyses show that it is.

Doran, who was not involved with the first study, feels that a few of the questions from that study were poorly written. Still, there wasn't any choice but to use the questions, he says, if a comparison between the first and second studies was to be made.

Nevertheless, Doran says, the preliminary analysis has shown that the effect of science education in the 1970s has been positive and significant gains in overall achievement at both grade levels. This is especially true for items requiring higher thinking abilities. However, there has been little change in the patterns of achievement between the results of SISS and those of other science studies: Sex differences in science achievement increase with schooling; biological science items are easier than physical science items; and ninth grade outperforms fifth grade by about the same margin. □

SISS is an international effort

The Second International Science Study (SISS) is a study of science achievement and the conditions under which science is studied and learned. A cooperative research study designed to review the state of elementary and secondary science education around the world, it is sponsored by the International Association for the Evaluation of Educational Achievement (IEA). For SISS, 28 countries are participating, many of them having taken part in the first study. Funds for the U.S. study have been provided by the Spencer Foundation, Chicago.

Countries participating in SISS include Australia, Botswana, Canada, China, Finland, Ghana, Hong Kong, Hungary, Israel, Italy, Japan, Mexico, Netherlands, Nigeria, Norway, Papua New Guinea, Philippines, Poland, Singapore, South Korea, Sri Lanka, Sweden, Tanzania, Thailand, U.K., U.S., Venezuela, and Zimbabwe.

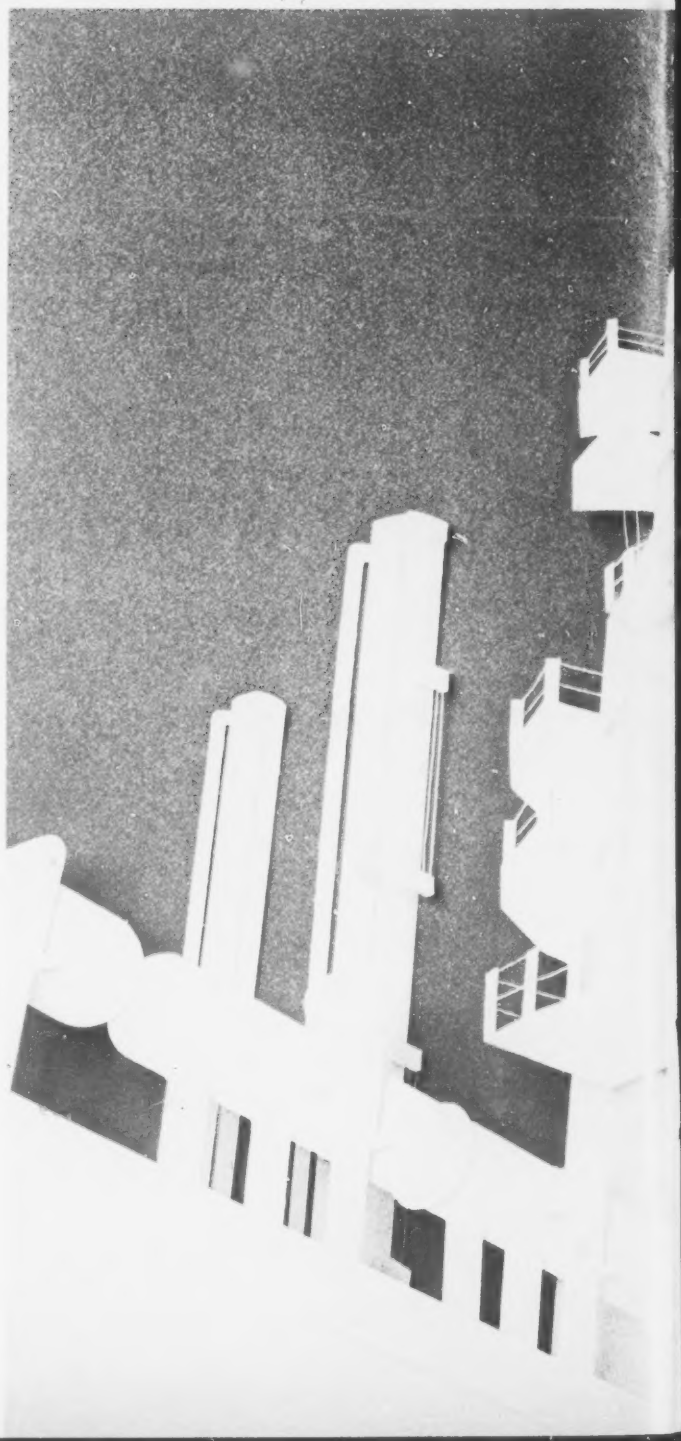
In each participating country, there is a national committee that advises on broad policy issues related to the national study. Most of the committees are composed of science educators, scientists, science teachers and supervisors, and people with skills useful in plannning and carrying out the study. The national research coordinators from each of the countries constitute an International Study Committee (ISC), which makes the major policy decisions for the international study. There is also a steering committee that plans agenda for ISC meetings, undertakes detailed work on curriculum analyses, oversees test and questionnaire development and preparation of manuals, and plans for data analysis and general supervision of the study. The international headquarters for the study are at the Australian Council for Educational Research, Victoria, and the international coordinator is Malcolm Rosier, chief research officer at the Australian council.

Although each country is conducting its own study, there are international core items in the achievement tests, and questions and statements that are common to all the questionnaires and opinionnaires being used. In this way, each country can analyze its findings within the context of corresponding data from the other countries.

There are plans in the U.S. for four reports to be published over the next couple of years. These reports include "Achievement in Science Education in the U.S.: Student, Teacher, School and Community Factors that Correlate with Science Achievement," "Science Education in the 1970s and 1980s," "Science Education in the U.S. and in Other Countries," and a report to policy-making groups and to the public, "Science Education in the U.S."

Facts &

for the chemical industry



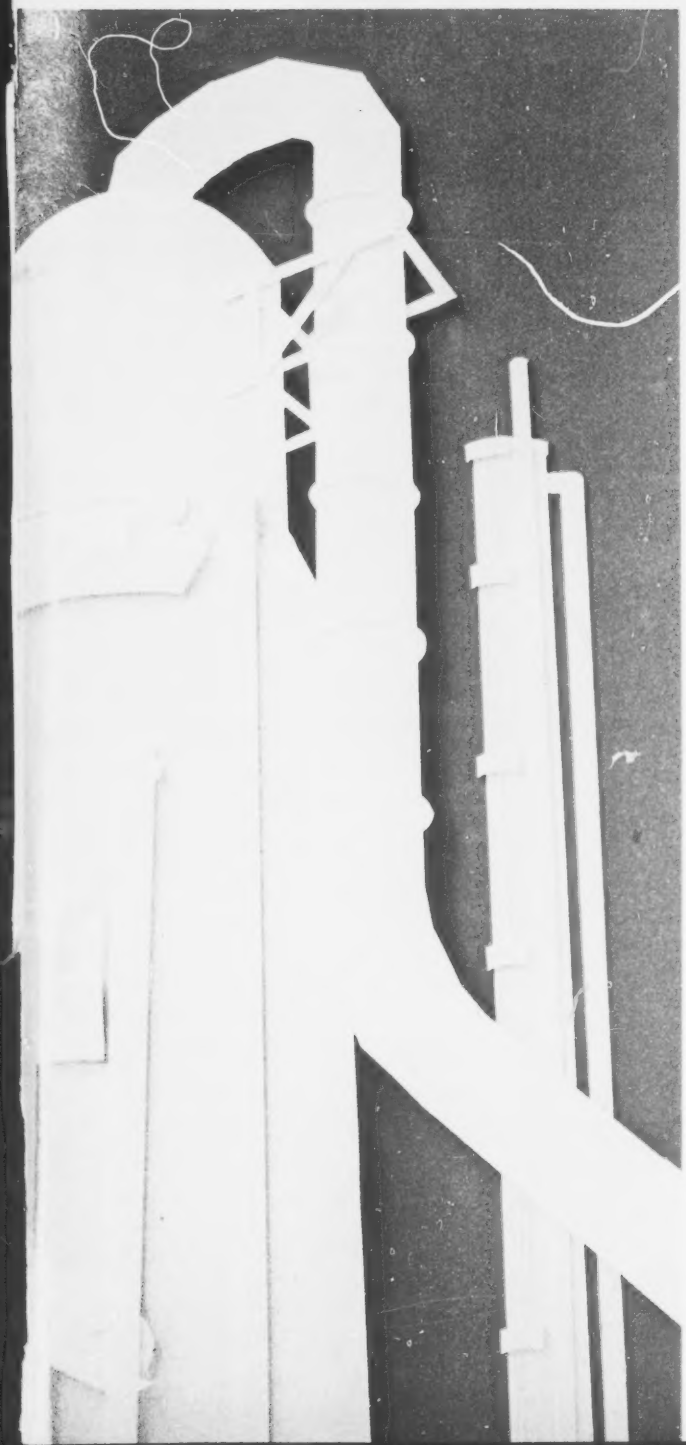
Last year, for the first time in four years, the statistics that measure the progress of the U.S. chemical industry generally had a favorable cast. Fueled by a strong recovery in most of its key markets, such as automobiles, housing, appliances, and apparel, the industry increased its output steadily during 1983. By year's end, production had recovered to about the same level where it had been before the painful 1981–82 recession.

The numbers look good, however, largely because they are being compared with the depressed results of the year before. Stacked up against figures for the late 1970s, last year's data look considerably less bright. So far, the decade of the 1980s has been a period of unsatisfactory growth, in terms of volume of production but even more so in profitability, for U.S. chemical producers.

Nevertheless, last year's expansion continues unabated during the first half of 1984. Industry executives, therefore, are just about unanimous in predicting further growth during the current year, although probably at a more modest rate than during the strong 1983 recovery.

The following pages of C&EN's annual Facts & Figures issue set forth the statistics that gauge the industry's performance, not only in the U.S. but abroad as well. They contain data gathered from a variety of sources, including government agencies, trade associations, international organizations, and the companies themselves that operate in the diverse and far-flung chemical industry. These data have been treated by the C&EN staff, in many cases, to develop analytical measures and comparisons in order to add dimension and perspective to the recent record of the industry.

Figures



at a glance

Section One: Production
It was all uphill for output in the U.S. chemical industry last year. Severely depressed at the end of 1982, production moved steadily higher month by month throughout 1983. For the year as a whole, total volume for chemicals and allied products was 10% higher than in 1982. Setting the pace, as usual, were plastics, with output up 20%. But for inorganic chemicals, the record was spotty, as cutbacks in agricultural acreage hurt demand for fertilizer chemicals. **Page 34**

Section Two: Finance
Chemical companies' financial reports improved significantly during the second half of 1983. With demand rising, shipments were 9% higher than in 1982. And the belt-tightening that had been instigated by the recession resulted in an even stronger showing for profits. **Page 41**

Section Three: Efficiency
Increased production coupled with the stringent cost-cutting measures that swept the chemical industry during the recent recession years has resulted in a marked improvement in the industry's productivity and a steep decline in unit labor costs. Plant operating rates also are much more favorable. **Page 56**

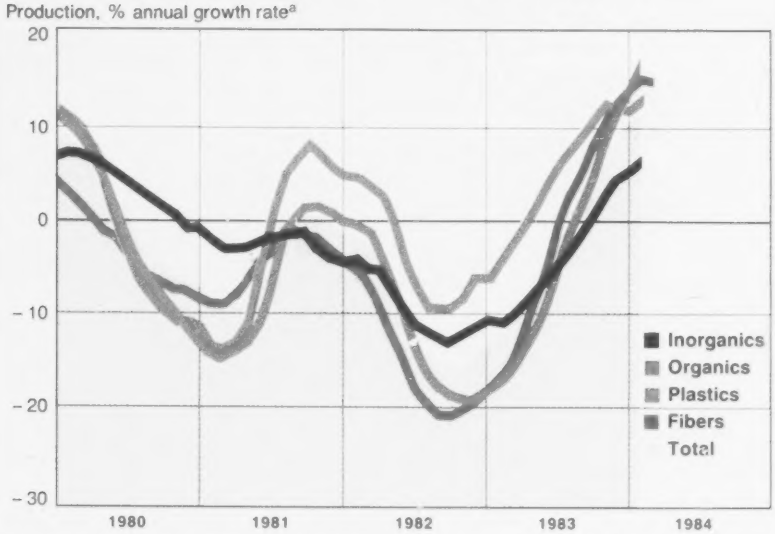
Section Four: Employment
Although employment in the chemical industry has been rising slightly in recent months, the total number of people at work in the industry last year was the smallest, on average, for any year since 1976. **Page 59**

Section Five: Foreign Trade
World trade in chemicals sagged for the third year in a row as nearly all the major chemical-producing countries experienced a drop in exports. For the U.S., the decline was less than 1%, but meanwhile imports of chemicals were considerably higher, topping $10 billion for the first time. Consequently, the U.S. industry's vaunted trade surplus narrowed to $9 billion, the lowest it has been since 1978. **Page 61**

Section Six: Foreign chemical industries
Recovery was the rule for chemical producers throughout the world, although in most cases the pace lagged that in the U.S. Increased demand, firmer prices, and the closing of unneeded capacity bolstered profits for chemical firms in Western Europe. The fortunes of chemical companies in Japan likewise were improved. The situation in Canada was similar, although high costs there have hurt the chemical industry's competitive position in world markets. **Page 63**

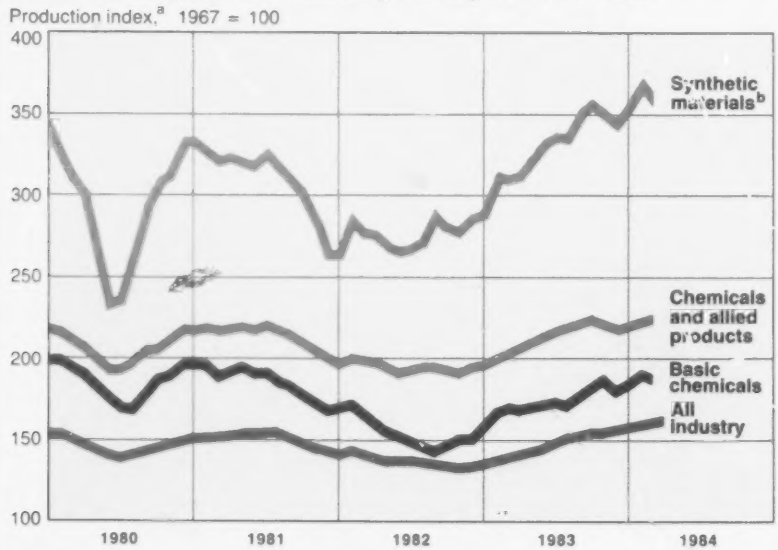
Output makes a strong recovery

Chemical growth rate climbs roller coaster in 1983



a Average running annual growth rates in production of major plastics, inorganic and organic chemicals, and all chemicals, and in shipments of man-made fibers. **Sources:** International Trade Commission, Bureau of the Census, Society of the Plastics Industry, Textile Economics Bureau

Chemical output rose steadily during most of 1983



a Seasonally adjusted. b Includes plastics, synthetic rubber, and man-made fibers.
Source: Federal Reserve Board

After a miserable 1982, U.S. chemical producers made a strong recovery in 1983, increasing output 10%. To put things in perspective, however, at its peak for 1983, in October, production of chemicals and allied products was only slightly above the highs of early 1981. A year of steady growth had brought the chemical industry only back to where it was three years earlier, before the recession started.

Strongest gains were made in production of synthetic materials, which grew nearly 20% in 1983. Man-made fibers output rose 18% from 1982, led by large increases in nylon, olefin, and textile glass production. Both cellulosic and noncellulosic fibers, however, still are being produced at levels far below 1979's highs.

Plastics output, in contrast, surged well past prerecession levels to a new high. Production of thermosetting resins, led by phenolics and other tar acid resins, rose 22%. Among thermoplastics, polyamide output increased a spectacular 41%, following a decrease of 27% in 1982.

Basic chemical production grew a healthy 12% in 1983. Output was up in every category—all of which had experienced double-digit declines in 1982. Organic chemicals production, buoyed by the recovery in polymers, rose 15%. Acids and fertilizer materials managed to grow a modest 4%, even though U.S. production, consumption, and exports of fertilizer declined in 1983 for the second year in a row.

Chemical products, which didn't do so badly as the industry as a whole in 1982, similarly didn't make so strong a recovery in 1983, with production rising only 4%. Still, drugs and medicines, soap and toiletries, and paints all had increases in output. Only production of agricultural chemicals continued to decline, albeit at a slower rate than in recent years.

TOP 50 CHEMICALS: Organic chemicals rebounded much more than inorganics in 1983

Rank 1983	Rank 1982[a]		Billions of lb 1983	Billions of lb 1982	Common units[b] 1983	Common units[b] 1982	Average annual growth 1982–83	1981–82	1978–83	1973–83
1	1	Sulfuric acid	69.45	65.36	34,725 tt	32,680 tt	6.3%	−19.7%	−3.3%	0.8%
2	2	Nitrogen	42.03	35.07	580 bcf	484 bcf	19.8	−1.2	8.2	9.8
3	5	Lime[c]	28.80	28.15	14,400 tt	14,075 tt	2.3	−25.5	−5.8	−3.2
4	4	Oxygen	28.73	28.81	347 bcf	348 bcf	−0.3	−19.3	−4.1	−1.1
5	6	Ethylene	28.59	24.50	28,586 mp	24,501 mp	16.7	−16.7	1.9	2.5
6	3	Ammonia	27.37	31.56	13,683 tt	15,778 tt	−13.3	−17.1	−4.5	−1.1
7	7	Sodium hydroxide	20.46	18.77	10,230 tt	9,385 tt	9.0	−9.9	−2.0	−0.5
8	8	Chlorine	19.92	18.35	9,960 tt	9,176 tt	8.5	−14.8	−2.1	−0.4
9	9	Phosphoric acid	19.90	16.52	9,950 tt	8,262 tt	20.4	−16.7	1.2	3.7
10	10	Sodium carbonate[d]	16.93	15.64	8,467 tt	7,819 tt	8.3	−5.6	4.6	1.2
11	11	Nitric acid	14.75	14.78	7,373 tt	7,390 tt	−0.2	−18.2	−1.5	−1.3
12	14	Propylene	13.98	12.54	13,984 mp	12,535 mp	11.6	−7.0	1.4	3.5
13	12	Ammonium nitrate[e]	13.24	14.18	6,618 tt	7,091 tt	−6.7	−19.3	−1.7	−0.9
14	13	Urea[f]	11.54	13.04	5,770 tt	6,518 tt	−11.5	−19.6	−1.7	5.2
15	16	Ethylene dichloride	11.25	7.62	11,247 mp	7,619 mp	47.6	−23.6	0.4	1.9
16	15	Benzene	9.48	7.75	1,287 mg	1,052 mg	22.3	−19.5	−2.9	−1.2
17	19	Ethylbenzene	7.86	6.66	7,857 mp	6,656 mp	18.0	−14.8	−1.3	3.3
18	18	Carbon dioxide[g]	7.15	7.36	3,574 tt	3,682 tt	−2.9	−2.9	2.4	8.6
19	21	Toluene[h]	7.12	5.18	981 mg	714 mg	37.4	−16.2	−1.4	0.2
20	20	Styrene	6.99	5.94	6,987 mp	5,942 mp	17.6	−11.0	−0.6	1.6
21	24	Vinyl chloride	6.95	4.90	6,950 mp	4,902 mp	41.8	−28.7	0.0	2.6
22	17	Methanol	6.62	7.56	6,624 mp	7,555 mp	−12.3	−11.9	0.6	−0.6
23	25	Terephthalic acid[i]	5.69	4.84	5,688 mp	4,843 mp	17.4	−22.3	−0.9	4.0
24	22	Ethylene oxide	5.58	4.99	5,575 mp	4,987 mp	11.8	−2.4	2.2	3.0
25	27	Xylene	5.57	4.74	773 mg	658 mg	17.5	−25.3	−1.8	−0.2
26	26	Formaldehyde[j]	5.40	4.82	5,398 mp	4,817 mp	12.1	−15.8	−3.3	−1.7
27	23	Hydrochloric acid	5.22	4.92	2,608 tt	2,460 tt	6.0	−1.7	−1.3	0.4
28	28	Ethylene glycol	4.46	4.31	4,460 mp	4,309 mp	3.5	4.0	2.7	3.1
29	31	*p*-Xylene	4.11	3.21	4,109 mp	3,207 mp	28.1	−29.2	3.2	5.9
30	30	Ammonium sulfate	3.94	3.54	1,968 tt	1,768 tt	11.3	−16.2	0.3	−0.1
31	33	Cumene	3.30	2.74	3,304 mp	2,743 mp	20.5	−17.1	−0.5	2.2
32	29	Potash[k]	2.87	3.93	1,300 tmt	1,784 tmt	−27.1	−17.3	−10.4	−6.7
33	32	Acetic acid	2.79	2.75	2,794 mp	2,748 mp	1.7	−10.6	0.1	1.4
34	37	Phenol[l]	2.61	2.02	2,612 mp	2,023 mp	29.1	−21.5	−0.5	1.5
35	35	Carbon black	2.50	2.30	2,496 mp	2,302 mp	8.4	−15.7	−5.7	−3.3
36	38	Butadiene[m]	2.31	1.92	2,312 mp	1,915 mp	20.7	−35.9	−8.0	−4.4
37	34	Aluminum sulfate	2.29	2.37	1,144 tt	1,186 tt	−3.5	−8.3	−2.7	−0.7
38	36	Acrylonitrile	2.15	2.04	2,146 mp	2,035 mp	5.5	2.0	4.1	4.7
39	39	Vinyl acetate	1.96	1.88	1,962 mp	1,876 mp	4.6	−3.1	3.0	2.7
40	40	Calcium chloride[n]	1.88	1.75	942 tt	875 tt	7.7	−20.2	−1.8	−1.4
41	42	Acetone	1.87	1.69	1,873 mp	1,694 mp	10.6	−21.0	−5.8	−0.6
42	41	Sodium sulfate[o]	1.71	1.73	854 tt	864 tt	−1.2	−25.8	−6.1	−5.1
43	48	Cyclohexane	1.69	1.28	1,688 mp	1,275 mp	32.4	−29.9	−6.3	−2.3
44	43	Propylene oxide	1.58	1.48	1,581 mp	1,477 mp	7.0	−14.8	−5.0	−1.0
45	46	Titanium dioxide	1.51	1.31	757 tt	657 tt	15.2	−13.7	1.5	−0.4
46	45	Sodium silicate	1.45	1.33	726 tt	664 tt	9.3	−13.9	−2.6	0.0
47	49	Adipic acid	1.42	1.20	1,415 mp	1,197 mp	17.0	−1.1	−2.9	−1.1
48	47	Sodium tripolyphosphate	1.34	1.30	669 tt	651 tt	2.8	−6.5	−2.0	−3.6
49	44	Isopropyl alcohol	1.21	1.38	1,212 mp	1,380 mp	−12.2	−17.3	−6.9	−4.1
50	50	Ethanol	1.10	1.02	1,104 mp	1,023 mp	7.9	−22.3	−2.7	−5.6
TOTAL ORGANICS			**165.17**	**143.96**			**14.7%**	**−17.9%**	**−0.1%**	**1.5%**
TOTAL INORGANICS			**333.41**	**319.04**			**4.5%**	**−15.6%**	**−1.5%**	**0.7%**
GRAND TOTAL			**498.58**	**463.00**			**7.7%**	**−16.3%**	**−1.0%**	**0.9%**

a Revised. b tt = thousands of tons, bcf = billions of cubic feet, mp = millions of pounds, mg = millions of gallons, tmt = thousands of metric tons. c Except refractory dolomite. d Synthetic and natural. e Original solution. f 100% basis. g Liquid and solid only. h All grades. i Includes both acid and ester without double counting. j 37% by weight. k K_2O basis. l Synthetic only. m Rubber grade. n Solid and liquid. o High and low purity. **Sources:** Bureau of the Census, Bureau of Mines, International Trade Commission, C&EN estimates

PRODUCTION: Chemical industry last year returned to 1981 levels

Industrial production indexes, 1967 = 100	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Annual change 1982–83	Annual change 1973–83
Total index	147.6	138.6	151.0	147.0	152.5	146.1	138.2	130.5	117.8	129.3	129.8	6%	1%
Manufacturing, total	148.2	137.6	150.4	146.7	153.6	146.8	138.4	130.3	116.3	129.4	129.8	8	1
Nondurable manufacturing	168.1	156.2	164.8	161.2	164.0	156.9	150.5	141.8	126.4	134.6	133.8	8	2
Chemicals and products	215.0	196.1	215.6	207.1	211.8	197.4	185.7	170.9	147.2	159.4	154.5	10	3
Chemicals and synthetic materials	226.2	196.7	228.6	222.2	234.2	216.7	201.1	185.1	154.1	176.7	171.9	15	3
Basic chemicals	175.2	157.1	186.8	187.4	192.0	181.9	171.8	161.8	135.9	153.3	147.7	12	2
Alkalies and chlorine	108.5	99.2	114.7	121.4	132.3	119.7	119.2	119.0	106.5	125.6	123.8	9	−1
Gases, coal tar, inorganic pigments	177.4	160.0	181.5	184.3	197.7	186.0	174.3	164.4	133.3	165.0	157.8	11	1
Basic organic chemicals	220.9	192.9	236.7	231.6	233.3	221.2	204.7	189.8	155.3	177.9	170.0	15	3
Inorganic chemicals, nec	114.4	109.9	125.5	132.4	134.9	129.3	128.5	124.3	112.9	112.6	110.8	4	−1
Acids and fertilizer materials	121.2	116.0	137.2	145.9	142.0	133.6	124.2	117.6	108.4	116.6	113.1	4	1
Synthetic materials	330.3	277.4	313.7	293.3	320.1	287.6	260.8	232.5	191.0	224.4	221.1	19	4
Plastics materials	486.0	403.6	429.3	386.5	420.1	366.5	320.3	280.1	213.1	258.5	243.3	20	7
Synthetic rubber	109.2	84.9	103.3	103.2	130.5	127.5	124.5	118.7	101.2	129.7	135.6	29	−2
Man-made fibers	236.2	204.2	254.4	250.3	270.8	250.9	236.8	214.3	191.2	214.4	220.1	16	1
Chemical products	204.0	195.8	203.0	192.4	190.2	179.0	170.9	157.2	140.7	142.8	137.7	4	4
Drugs and medicines	280.6	266.8	267.1	245.7	238.2	220.6	213.9	191.5	174.1	179.6	170.1	5	5
Soap and toiletries	179.1	171.5	177.0	170.8	171.6	163.8	155.0	143.0	127.7	128.1	129.0	4	3
Paints	118.3	115.3	127.4	130.5	137.8	132.6	125.8	122.8	114.2	119.2	114.7	3	0
Agricultural chemicals	197.3	208.7	241.4	230.5	221.6	211.8	201.1	185.4	163.9	144.6	127.0	−5	5
Petroleum products	120.3	121.8	129.7	132.9	143.9	145.2	142.6	133.5	124.1	124.7	128.5	−1	−1
Rubber and plastics products	291.9	254.7	274.0	255.7	272.2	253.6	232.3	199.7	166.7	195.2	184.1	15	5

nec = not elsewhere classified. **Source:** Federal Reserve Board

MINERALS: Production of fertilizer raw materials recovered somewhat in 1983

Thousands of tons	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Annual change 1982–83	Annual change 1973–83
Bromine, sold or used[a]	190[b]	200	189	189	249	223	217	230	204	216	209	−5%	−1%
Calcium chloride, production[c,d]	912[b]	853	917	811	981	1,031	968	897	828	1,101	858	7	1
Iodine, consumption[e,f]	3.6[b]	3.4	4.4	4.4	4.4	4.0	4.3	3.6	3.1	3.8	3.5	6	0
Imports[f]	2.5[b]	2.3	3.0	3.1	3.1	3.4	3.5	3.2	2.7	4.0	3.1	9	−2
Lime, sold or used[g]	14,719[b]	14,112	18,890	19,037	20,983	20,484	19,987	20,257	19,159	21,645	21,132	4	−4
Lithium, consumption[e,h]	2.2[b]	2.0	3.2	3.0	3.2	3.4	4.1	2.8	2.9	3.8	3.2	10	−4
Phosphate rock													
Marketable production	46,928	41,241	59,110	59,982	56,891	55,156	52,091	49,231	48,806	45,676	42,128	14	1
Exports	13,239	10,849	11,458	15,737	15,827	14,187	14,584	10,398	12,270	13,895	13,873	22	−1
Potash (K_2O equivalent)[i]													
Production	1,433[b]	1,967	2,377	2,468	2,453	2,484	2,457	2,400	2,501	2,552	2,604	−27	−6
Imports[j]	4,630[b]	4,253	5,287	5,481	5,693	5,189	5,076	4,594	3,797	4,325	3,587	9	3
Apparent consumption	5,699[b]	5,647	6,849	6,999	7,620	6,840	6,605	6,149	5,113	6,086	5,563	1	0
Salt, total sold or used[k]	31,500[b]	37,880	38,915	40,396	45,820	42,896	43,439	44,218	41,057	46,565	43,939	−17	−3
Evaporated	5,040[b]	5,303	6,209	6,358	6,248	5,872	5,704	5,634	5,372	5,951	5,913	−5	−2
Rock	11,340[b]	12,879	11,871	11,806	14,891	14,688	14,958	15,668	14,283	14,835	12,347	−12	−1
Salt in brine[l]	15,120[b]	19,698	20,835	22,231	24,681	22,336	22,777	22,917	21,401	25,779	25,680	−23	−5
Sodium carbonate, production[d]	8,400[b]	7,819	8,281	8,275	8,253	8,290	8,040	7,560	7,130	7,566	7,535	7	1
Sulfur, production[m]	10,240	10,788	13,388	13,080	13,339	12,318	11,824	11,992	12,610	12,789	12,231	−5	−2
Apparent consumption[n]	12,112	11,088	14,093	15,056	15,145	13,889	12,850	12,060	11,875	12,115	11,463	9	1
Frasch, production	3,530	4,641	6,997	7,044	7,007	6,226	6,520	7,016	8,077	8,849	8,518	−24	−8
Recovered elemental, production	5,462	4,855	4,695	4,490	4,486	4,478	3,995	3,514	3,326	2,948	2,706	13	7
Other, production	1,249	1,293	1,695	1,547	1,845	1,615	1,310	1,462	1,208	992	1,008	−3	2

a Elemental bromine sold as such or used in preparation of bromine compounds by primary producers. **b** Preliminary figure. **c** 75% $CaCl_2$ equivalent. **d** Natural and synthetic. **e** Estimated apparent consumption. **f** Crude elemental iodine. **g** Includes Puerto Rican production. **h** Lithium content basis. **i** Includes muriate and sulfate of potash, potassium magnesium sulfate, and parent salts; excludes other chemical compounds containing potassium. **j** Includes nitrate of potash. **k** Total obtained by all recovery methods that was sold or used by domestic producers (figures differ slightly from U.S. production figures); figures for 1973–81 include Puerto Rican production. **l** Sold or used as such. **m** Sulfur content basis. **n** Calculated from shipments plus imports minus exports (sulfur content basis). **Source:** Bureau of Mines

ORGANIC CHEMICALS: Output of most products increased, reversing 1982 trend

Millions of lb unless otherwise noted	Production											Annual change	
	1983[a]	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1982–83	1973–83
Acetic acid, synthetic	2,794	2,748	2,705	2,977	3,265	2,776	2,570	2,463	2,197	2,584	2,429	2%	1%
Acetone	1,873	1,694	2,144	2,076	2,653	2,519	2,219	1,869	1,640	1,980	1,989	11	−1
Acrylonitrile	2,146	2,035	1,997	1,830	2,018	1,752	1,646	1,518	1,215	1,412	1,354	5	5
Aniline	665	557	634	659	690	606	584	544	407	551	458	19	4
Benzene, mg[b,c]	1,287	1,069	1,339	1,585	1,673	1,488	1,457	1,425	1,024	1,488	1,453	20	−1
Bisphenol A	643	480	555	530	576	471	455	449	293	370	320	34	7
1,3-Butadiene[d]	2,312	1,915	2,986	2,799	3,583	3,515	3,259	3,507	2,597	3,682	3,644	21	−4
Butanol	801	730	809	790	766	756	660	625	490	558	519	10	4
Caprolactam	979	793	928	905[e]	945	919	867	780	713	668	656	23	4
Carbon disulfide	na	261	388	377	448	476	505	508	479	782	777	na	na
Carbon tetrachloride	573	587	726	710	714	737	809	857	906	1,163	1,047	−2	−6
Chloroform	351	299	405	273	356	349	302	292	262	302	253	17	3
Cumene	3,304	2,743	3,309	3,459	3,917	3,380	2,644	2,716	2,003	2,906	2,665	20	2
Cyclohexane	1,688	1,275	1,820	1,964	2,425	2,332	2,265	2,187	1,734	2,352	2,123	32	−2
Dioctyl phthalates	288	266	304	353	336	409	400	413	312	395	429	8	−4
Dodecylbenzene[f]	na	509	535	563[e]	627	526	526	529	495	533	498	na	na
Ethanol, synthetic	1,103	1,023	1,317	1,451	1,408	1,267	1,339	1,496	1,429	1,618	1,962	8	−6
Ethanolamines[g]	469	416	429	376	420	362	308	286	258	307	293	13	5
Ethyl chloride	282	339	324	396	582	540	612	669	575	662	660	−17	−8
Ethylbenzene	7,857	6,656	7,813	7,642	8,448	8,385	8,312	5,770	4,822	6,048	5,688	18	3
Ethylene	28,586	24,501	29,418	28,667	29,904	25,955	25,172	22,475	20,499	23,891	22,329	17	3
Ethylene dichloride	11,247	7,619	9,974	11,108	11,794	11,001	10,997	8,042	7,977	9,165[h]	9,293[h]	48	2
Ethylene glycol	4,460	4,309	4,143	4,386	4,729	3,904	3,675	3,335	3,809	3,341	3,278	4	3
Ethylene oxide	5,575	4,987	4,937	5,220	5,665	5,012	4,364	4,184	4,467	4,200[i]	4,167	12	3
2-Ethylhexanol	387	325	389	367	318	420	493	450	387	395	402	19	0
Formaldehyde, 37%[j]	5,398	4,817	5,721	5,555	5,971	6,381	6,046	5,449	4,558	5,764	6,424	12	−2
Isopropyl alcohol	1,212	1,380	1,669	1,836	1,900	1,730	1,888	1,936	1,521	1,939	1,835	−12	−4
Maleic anhydride	302	260	293	304	323	341	294	264	216	290	282	16	1
Methanol, synthetic	6,624	7,555	8,577	7,153	7,367	6,443	6,453	6,242	5,176	6,878	7,064	−12	−1
Methyl chloride	396	366	405	362	463	454	476	378	366	493[h]	544[h]	8	−3
Methyl ethyl ketone	535	468	611	587	656	661	512	428	425	506	541	14	0
Methyl chloroform	586	595	614	692	716	644	635	631	459	592	548	−2	1
Methylene chloride	530	532	592	564	633	570	478	538	497	609	520	0	0
Perchloroethylene	508	585	691	765	773	725	614	669	679	734	706	−13	−3
Phenol, synthetic[k]	2,612	2,023	2,578	2,568	2,981	2,682	2,338	2,121	1,746	2,298	2,241	29	2
Phthalic anhydride	851	684	870	818	1,013	978	926	902	702	977	1,023	24	−2
Propylene[c]	13,894	12,535[l]	13,482[l]	13,676[l]	14,198[l]	13,014[l]	13,328[l]	10,030[l]	8,709[l]	10,475[m]	9,884[m]	11	3
Propylene glycol	481	400	473	488	610	547	489	517	391	510	502	20	0
Styrene, monomer	6,987	5,942	6,679	6,856	7,484	7,186	6,867	6,301	4,673	5,956	5,975	18	2
Terephthalic acid, dimethyl ester[n]	5,688	4,843	6,235	6,054	6,159	5,954	5,410	5,051	4,614	4,262	2,564[o]	17	8
Toluene, mg[b,c]	981	715	856	1,017	1,010	1,054	1,018	999	705	922	958	37	0
Vinyl acetate	1,962	1,876	1,936	1,922	1,982	1,692	1,586	1,481	1,290	1,403	1,503	5	3
Vinyl chloride	6,950	4,902	6,874	6,466	6,389	6,941	5,986	5,677	4,196	5,621	5,351	42	3
***o*-Xylene**	774	802	918	995	1,082	1,013	985	854	703	1,056	1,068	−3	−3
***p*-Xylene**	4,109	3,391	4,532	4,238	4,650	3,516	3,172	2,911	2,484	2,707	2,326	21	6

a Preliminary. **b** Tar distillers not included; includes material for use in blending motor fuels. **c** All grades. **d** Rubber grade. **e** Preliminary figure; final figure not available. **f** Includes straight-chain dodecylbenzene, tridecylbenzene, and other straight-chain alkylbenzenes. **g** Mono-, di-, and triethanolamines. **h** Production figure may be too low, because some methyl chloride and ethylene dichloride were produced but not separated or measured accurately by some producers. **i** Approximate. **j** By weight. **k** Does not include data for coke ovens and gas retort ovens. **l** Includes refinery propylene. **m** Includes data for propane-propylene mixture. **n** Includes both acid and dimethyl ester (DMT), without double counting. **o** Includes only dimethyl ester. **mg** = millions of gallons. **na** = not available. **Source:** International Trade Commission

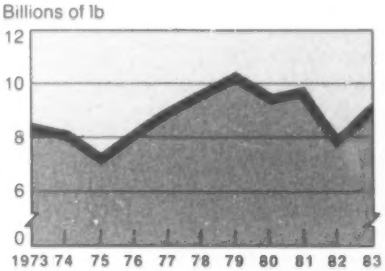
INORGANICS: Production of most chemicals recovered from 1982 lows

Thousands of tons unless otherwise noted	Production											Annual change	
	1983[a]	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1982–83	1973–83
Aluminum sulfate[b]	1,144	1,154	1,294	1,286	1,315	1,309	1,255	1,202	1,146	1,257	1,233	−1%	−1%
Ammonia,[c,d] 100%	13,683	15,776	19,044	19,653	18,634	17,119	17,765	16,716	16,419	15,733	15,208	−13	−1
Ammonium nitrate,[e] 100%	6,618	7,091	8,861	9,128	8,293	7,210	7,177	7,186	7,088	7,542	7,235	−7	−1
Ammonium sulfate,[d,f] 100%	1,968	1,768	2,185	2,136	2,363	2,449	2,264	2,010	2,106	2,120	1,987	11	0
Chlorine gas[g]	9,960	9,176	10,763	11,421	12,291	11,052	10,573	10,378	9,167	10,753	10,402	9	0
Hydrochloric acid,[h] 100%	2,608	2,460	2,574	2,888	3,090	2,793	2,668	2,542	2,009	2,470	2,534	6	0
Hydrogen,[i,j] bcf, 100%	104	89	105	107	106	90	85	82	74	82	65	17	5
Nitric acid,[k] 100%	7,373	7,390	9,093	9,231	8,916	7,934	7,987	7,791	7,527	8,120	8,398	−0	−1
Nitrogen gas,[i,l] bcf, 100%	580	484	490	479	427	379	328	289	252	243	227	20	10
Oxygen,[i,l] bcf, 100%	347	349	431	431	456	430	392	388	353	390	389	−1	−1
Phosphoric acid, 100% P_2O_5	9,950	8,262	9,958	10,848	10,318	9,637	8,745	7,949	7,677	7,213	6,927	20	2
Phosphorus[m]	366	361	426	432	460	441	430	437	450	524	526	1	−4
Sodium chlorate, 100%	229	251	297	312	269	265	251	199	173	203	204	−9	1
Sodium hydroxide, 100%	10,230	9,385	10,621	11,625	12,759	11,309	11,000	10,516	9,635	11,189	10,734	9	−0
Sodium phosphate[n]	669	651	696	727	757	739	717	724	770	903	967	3	−4
Sodium silicate[o]	731	664	771	805	813	829	760	747	724	770	723	10	0
Sodium sulfate,[p] 100%	855	864	1,111	1,140	1,121	1,174	1,199	1,232	1,227	1,348	1,437	−1	−5
Sulfuric acid,[q] 100%	34,725	32,680	40,742	44,158	43,204	41,314	38,337	34,878	32,360	33,936	31,949	6	1
Titanium dioxide,[r] 100%	757	657	761	727	742	701	687	713	603	787	785	15	0
Urea, 100%	5,770	6,518	8,062	7,830	7,000	6,273	5,072	4,498	3,799	3,789	3,543	−11	5

a Preliminary. b Commercial, 17% Al_2O_3; includes municipalities. c Synthetic anhydrous. d Excludes by-product ammonia liquor and ammonium sulfate. e Original solution. f Synthetic and noncoke by-product. g Includes quantities liquefied for use, storage, or shipment. h Includes anhydrous hydrochloric acid production. i High- and low-purity gas. j Liquid and gas; excludes amounts vented and used as fuel, and amounts produced in petroleum refineries for captive use. k Includes unspecified amounts of nitric acid produced but not withdrawn from the system. l Excludes amounts produced and consumed in making synthetic ammonia or ammonia derivatives. m Elemental, white (yellow), and red. n Tripolyphosphate (100% $Na_5P_3O_{10}$). o Soluble silicate glass (water glass), solid and liquid (anhydrous); excludes amounts produced and consumed in making meta-, ortho-, and sesquisilicates. p Anhydrous, high and low purity, and Glauber's salt. q Gross (new and fortified). r Composite and pure. **Note:** bcf = billions of cubic feet. **Sources:** Department of Commerce, International Trade Commission

MAN-MADE FIBERS: Production was up in 1983, but remained well below earlier peak

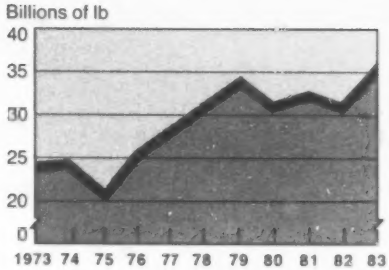
Man-made fibers production



Millions of lb	Production											Annual change	
	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1982–83	1973–83
CELLULOSIC FIBERS													
Acetate[a]	229	196	261	316	324	308	290	298	313	382	462	−17%	−7%
Rayon	401	388	509	490	606	597	598	543	436	817	895	3	−8
NONCELLULOSIC FIBERS													
Acrylic[b]	671	624	691	779	761	726	709	621	525	631	742	7	−1
Nylon[c]	2419	1927	2332	2358	2,720	2550	2326	2075	1857	2124	2175	26	1
Olefins[d]	906	723	785	748	759	692	635	577	497	531	492	25	6
Polyester	3544	3169	4176	3989	4,178	3800	3642	3340	2995	2926	2888	12	2
Textile glass	1168	899	1041	867	1,014	923	787	676	546	683	688	30	5
TOTAL	**9336**	**7926**	**9795**	**9547**	**10,362**	**9596**	**8987**	**8130**	**7169**	**8094**	**8342**	**18%**	**1%**

a Includes diacetate and triacetate; excludes production for cigarette filtration. b Includes modacrylic. c Includes aramid. d Includes olefin yarn and monofilaments, and olefin and vinyon staple and tow. **Note:** Totals may not add because of rounding. **Source:** Textile Economics Bureau

Plastics production



PLASTICS: Production in 1983 surged to a new high

Millions of lb[a]	Production											Annual change	
	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1982–83	1973–83
THERMOSETTING RESINS													
Epoxy[b]	334	286	336	315	361	299	261	244	198	249	223	17%	4%
Polyester[c]	1,084	865	997	947	1,147	1,209	1,061	1,042	834	911	1,051	25	0
Urea	1,172	998	1,165	1,165	1,367	1,122	963	821	690	835	867	17	3
Melamine	180	158	179	167	200	202	200	186	115	164	170	14	1
Phenolic[d]	2,477[e]	2,006[e]	2,333[e]	1,499	1,781	1,617	1,458	1,340	1,051	1,335	1,387	23	nc
TOTAL	**5,247**	**4,313**	**5,010**	**4,093**	**4,856**	**4,449**	**3,943**	**3,633**	**2,888**	**3,494**	**3,698**	**22%**	nc
THERMOPLASTIC RESINS													
Polyethylene													
Low density[f]	8,041	7,503	7,693	7,291	7,793	7,111	6,471	5,813	4,743	5,973	5,803	7	3
High density[g]	5,689	4,928	4,695	4,405	5,010	4,201	3,652	3,125	2,468	2,837	2,637	15	8
Polypropylene	4,433	3,477	3,955	3,648	3,841	3,074	2,747	2,632	1,902	2,249	2,162	27	7
Styrene-acrylonitrile	93	91	107	111	124	120	115	113	109	109	121	2	−3
Polystyrene	3,570	3,191	3,621	3,521	4,005	3,823	3,446	3,195	2,662	3,364	3,322	12	1
Styrene-butadiene copolymers, acrylonitrile-butadiene-styrene, and other styrene polymers	1,889	1,380	1,745	1,705	2,107	2,012	1,882	1,744	1,227	1,536	1,580	37	2
Polyamide, nylon type	321	228	312	274	327	275	254	247	135	204	205	41	5
Polyvinyl chloride and copolymers	6,067	5,326	5,707	5,470	6,119	5,723	5,253	4,716	3,648	4,850	4,562	14	3
Other vinyl resins[h]	186	177	208	196	220	197	197	225	187	209	199	5	−1
TOTAL	**30,289**	**26,301**	**28,043**	**26,621**	**29,546**	**26,536**	**24,017**	**21,810**	**17,081**	**21,331**	**20,591**	**15%**	**4%**

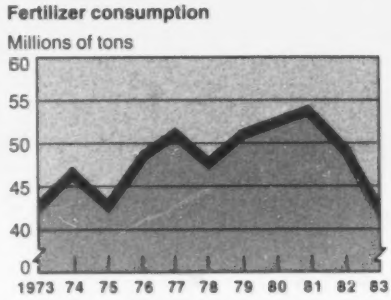
a Dry-weight basis, unless otherwise specified. b Unmodified. c Unsaturated. d Includes other tar acid resins. e Gross weight basis. f 0.940 density and below. g Density above 0.940. h Includes polyvinyl butyral, polyvinyl formal, and polyvinylidene chloride. **nc** = not comparable. **Source:** Society of the Plastics Industry

SYNTHETIC RUBBER: Production expanded in 1983, but not to levels of 1970s

Thousands of metric tons	Production											Annual change	
	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1982–83	1973–83
Styrene-butadiene rubber[a]	904	876	1032	1074	1378	1395	1395	1333	1179	1466	1537	3%	−5%
Polybutadiene	333	288	342	311	397	378	361	352	290	310	337	16	0
Nitrile	55	45	66	63	75	73	70	73	55	88	84	22	−4
Ethylene-propylene	175	123	178	144	175	174	158	130	84	126	120	42	4
Polychloroprene	115	119	143	151	183	161	165	165	144	163	na	−3	na
Other[b]	396[c]	379[c]	261	272	326	292	267	250	188	345	549[d]	4	na
TOTAL	**1978**	**1830**	**2022**	**2015**	**2534**	**2473**	**2416**	**2303**	**1940**	**2498**	**2627**	**8%**	**−3%**

a Excludes high-styrene latex (more than 45% styrene). b Includes butyl, polyisoprene, silicone, and other synthetic elastomers. Excludes polyurethane rubber. c Values are partly estimated. d Includes polychloroprene. **na** = not available. **Source:** Rubber Manufacturers Association

FERTILIZERS: U.S. production continued in the doldrums last year



Note: Years ending June 30.
Source: Department of Agriculture

Thousands of tons	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Annual change 1982–83	Annual change 1973–83
NITROGEN (N)													
Domestic production	9,855	11,598	13,036	12,323	11,106	10,466	10,789	10,572	9343	10,094	9447	−15%	0%
Imports	2,654	2,531	2,455	2,566	2,165	1,866	1,842	1,218	1198	1,068	882	5	12
Exports	2,074	2,499	3,088	2,641	2,468	1,778	1,251	1,239	1115	1,269	1508	−17	3
Domestic supply	10,435	11,630	12,403	12,248	10,803	10,554	11,380	10,551	9426	9,893	8821	−10	2
PHOSPHATE (P_2O_5)													
Domestic production	8,043	7,818	10,471	10,012	9,432	8,245	7,793	7,199	7230	6,869	6387	3	2
Imports	133	193	250	239	236	229	245	221	274	315	312	−31	−8
Exports	3,916	3,751	4,381	3,925	3,848	3,290	2,501	2,175	1860	1,581	1422	4	11
Domestic supply	4,260	4,260	6,340	6,326	5,820	5,184	5,537	5,245	5644	5,603	5277	0	−2
POTASH (K_2O)													
Domestic production	1,859	1,831	2,262	2,474	2,519	2,176	2,584	2,313	2287	2,604	2690	2	−4
Imports	4,402	4,797	5,487	5,403	5,085	4,948	4,955	3,910	3847	4,114	3192	−8	3
Exports	624	641	876	1,048	999	1,003	994	911	848	947	922	−3	−4
Domestic supply	5,637	5,987	6,873	6,829	6,605	6,121	6,545	5,312	5286	5,771	4960	−6	1

U.S. fertilizer consumption fell for the second year in a row

Thousands of tons	Consumption 1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Annual change 1982–83	Annual change 1973–83
TYPE													
Mixed fertilizer[a]	18,800	20,815	23,525	23,270	23,742	22,110	24,099	22,958	20,647	24,067	22,547	−10%	−2%
Primary nutrient material[b]	23,500	27,918	30,463	27,221	25,600	23,511	24,999	23,935	19,959	20,897	19,275	−16	1
Secondary and micronutrients[c]	—	—	—	2,296	2,139	1,877	2,525	2,296	1,878	2,130	1,466	—	
TOTAL	**42,300**	**48,733**	**53,988**	**52,787**	**51,481**	**47,497**	**51,624**	**49,189**	**42,484**	**47,094**	**43,288**	**−13%**	**−0%**
PRIMARY NUTRIENT CONTENT													
Nitrogen (N)	9,185	10,974	11,924	11,407	10,715	9,965	10,647	10,412	8,601	9,157	8,295	−16	1
Phosphate (P_2O_5)	4,160	4,810	5,434	5,432	5,606	5,096	5,630	5,228	4,507	5,099	5,085	−14	−2
Potash (K_2O)	4,842	5,623	6,320	6,245	6,244	5,526	5,834	5,210	4,453	5,083	4,649	−14	0
TOTAL	**18,187**	**21,407**	**23,678**	**23,083**	**22,565**	**20,587**	**22,111**	**20,849**	**17,561**	**19,338**	**18,029**	**−15%**	**0%**

a Fertilizers that contain more than one primary nutrient. b Fertilizer materials that contain one primary nutrient. c Included in primary nutrient material in 1981–83. **Note:** Years ending June 30. **Source:** Department of Agriculture

NITROGEN OUTPUT: Dropped steeply in 1983

Thousands of tons (N)	1983	1982	1981	1973	Change 1982–83
Ammonia[a]	3587	5,032	5,455	3835	−29%
Ammonium nitrate[b,c]	943	1,105	1,225	1360	−15
Urea	1692	1,684	1,704	576	0
Ammonium sulfate[c]	395	432	555	500	−9
All other	3238	3,345	4,097	3179	−3
TOTAL	**9855**	**11,598**	**13,036**	**9450**	**−15%**

a Includes aqueous solutions. b Includes ammonium nitrate-limestone mixtures. c Adjusted for estimated quantity going into nonfertilizer uses. **Note:** Years ending June 30. **Source:** Department of Agriculture

PHOSPHATE OUTPUT: Recovered a bit

Thousands of tons (P_2O_5)	1983	1982	1981	1973	Change 1982–83
Ammonium phosphate[a]	5026	4434	6,015	2704	13%
Concentrated superphosphate	1184	1151	1,713	1666	3
Normal and enriched superphosphate	110	153	357	620	−28
All other	1723	2080	2,386	1397	−17
TOTAL	**8043**	**7818**	**10,471**	**6387**	**3%**

a Liquid and solid, excluding that combined with potash salts in process of manufacture. **Note:** Years ending June 30. **Source:** Department of Agriculture

Earnings rise but profitability is still low

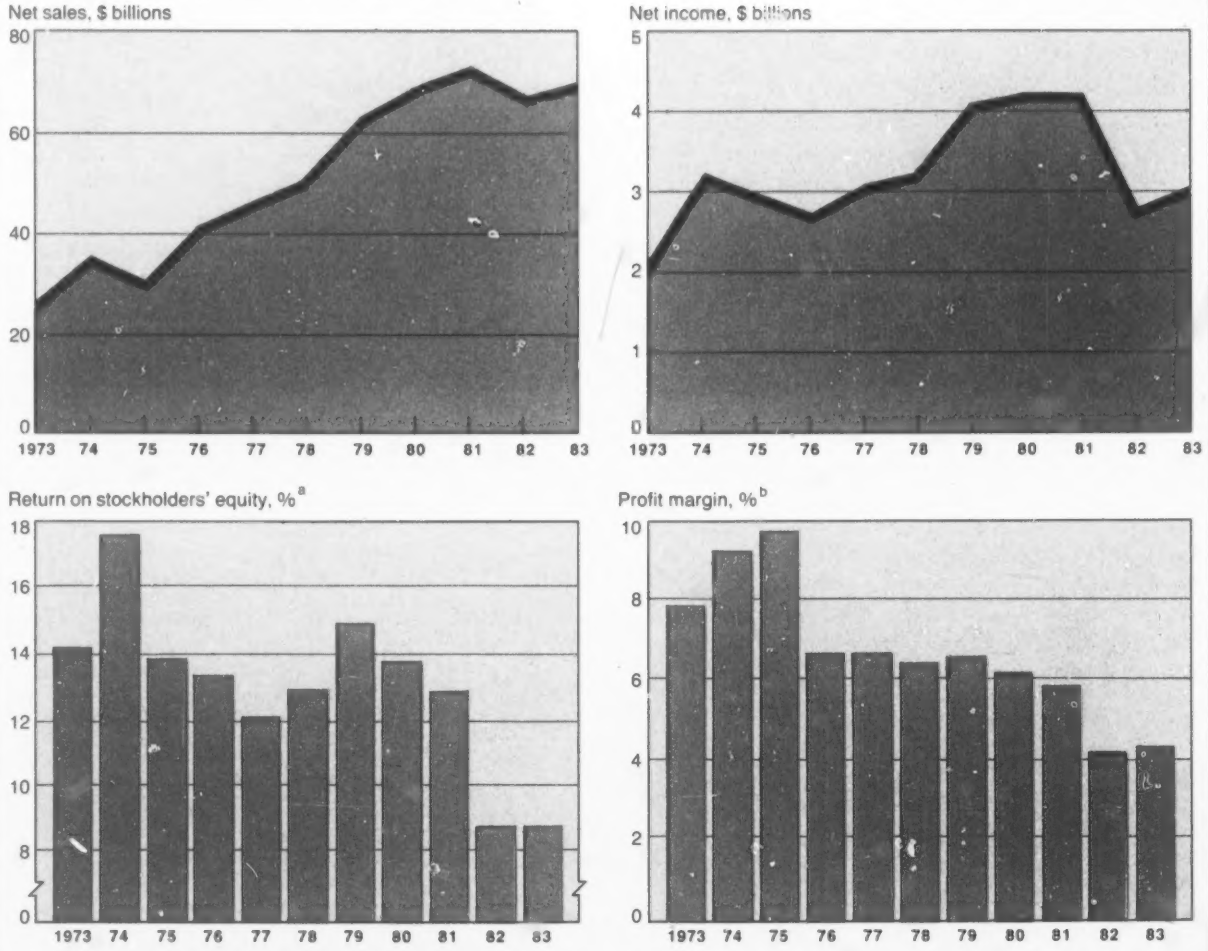
For the U.S. chemical industry, 1983 brought a climb from the depths of the recession. The year, if represented on a graph, is a slope upward for sales, profits, profitability, and production. The only laggard is pricing, which is still eliciting complaints from many chemical executives.

However, viewed as a whole, the year for the chemical industry was fairly flat. Sales increased just 5% to a total of $69.3 billion for a sample of 30 leading chemical companies. Profits at these companies increased 11% from the year before to $3.0 billion.

As a result, profit margins for the sample managed to climb to 4.3% in 1983 from 4.1% the year before. This is still well below the profit margin for the firms in 1981 of 5.8% and less than half the more than 9% the industry was earning on sales in 1974 and 1975.

While profit margins were climbing slightly, return on year-end stockholders' equity was going nowhere. Average return for the 30 companies in 1983 was 8.8%, the same as in 1982. Again, return on equity continues well down from returns in the teens that had been common in the past decade.

Chemical producers' sales and earnings both recovered last year, but not to previous peak, and profitability remained depressed



a After-tax earnings as a percentage of year-end stockholders' equity. b After-tax earnings as a percentage of sales. **Note:** Data based on annual figures for 30 major chemical companies.

TOP 100 CHEMICAL PRODUCERS: For only half of these companies do sales of chemicals account

Rank 1983	Rank 1982[a]	Company	Chemical sales 1983 ($ millions)	Change from 1982	Chemical sales as % of total sales	Industry classification	Chemical operating profit 1983[b] ($ millions)	Change from 1982	Chemical operating profits as % of total operating profit	Operating profit margin[c]	Chemical assets 1983 ($ millions)	Chemical assets as % of total assets	Operating return on chemical assets[d]
1	1	Du Pont	$11,607	6.4%	32.8%	Diversified	$1144	171.7%	26.2%	9.9%	$7591	31.1%	15.1%
2	2	Dow Chemical	8,875	8.1	81.0	Basic chemicals	573	153.5	111.0	6.5	8193	68.4	7.0
3	3	Exxon	8,439	39.5	7.5	Petroleum	348	640.4	3.9	4.1	4852	7.9	7.2
4	4	Monsanto	5,771[e]	11.8	92.6	Basic chemicals	568	8.4	102.3	9.8	4498	70.0	12.6
5	5	Union Carbide	3,912	−2.5	43.5	Basic chemicals	275	100.7	40.6	7.3	4917	47.8	5.6
6	7	Celanese	3,261	6.5	100.0	Basic chemicals	214	448.7	100.0	6.6	2869	100.0	7.5
7	6	Shell Oil	3,227	4.6	16.4	Petroleum	130	def	4.2	4.0	3759	17.0	3.5
8	8	Standard Oil (Ind.)	2,906	4.3	9.9	Petroleum	173	30.1	4.8	6.0	2445	9.6	7.1
9	9	W. R. Grace	2,760	5.3	44.4	Specialty chemicals	324	3.5	62.3	11.7	1641	32.6	19.7
10	11	Atlantic Richfield	2,550	13.8	9.8	Petroleum	64	def	2.4	2.5	2603	11.2	2.5
11	14	Allied	2,337	9.1	23.3	Diversified	224	69.7	20.3	9.6	1299	17.0	17.2
12	13	Mobil	2,331	8.5	4.0	Petroleum	−16	def	def	def	2266	6.5	def
13	12	Eastman Kodak	2,285	6.2	22.5	Photo equipment	214	4.4	20.8	9.4	2124	19.4	10.1
14	10	Phillips Petroleum	2,255	−4.3	14.8	Petroleum	83	260.9	3.2	3.7	1413	10.8	5.9
15	15	Hercules	2,007	−1.6	76.3	Basic chemicals	121	61.3	66.1	6.0	1204	55.4	10.0
16	17	Rohm & Haas	1,808	4.7	96.4	Basic chemicals	298	91.0	108.8	16.5	1038	68.7	28.7
17	16	Gulf Oil	1,748	−12.9	6.2	Petroleum	−76	def	def	def	1009	4.8	def
18	18	American Cyanamid	1,719	1.3	48.6	Basic chemicals	106	6.0	36.5	6.2	1275	41.7	8.3
19	20	Ethyl	1,478[e]	4.7	84.7	Basic chemicals	156	2.6	84.1	10.6	901	83.4	17.3
20	21	Air Products[f]	1,412	3.9	86.4	Basic chemicals	196	2.4	96.2	13.9	1654	74.5	11.8
21	19	Stauffer Chemical	1,340	nm	100.0	Basic chemicals	−14	def	def	def	2048	100.0	def
22	30	Mobay	1,300	15.0	100.0	Basic chemicals	66[g]	def	100.0	5.1	na	na	na
23	22	FMC	1,296	−1.8	37.0	Machinery	169	13.3	61.3	13.0	1063	38.2	15.9
24	25	Borden	1,295[e]	6.2	30.4	Dairy products	138	60.9	37.3	10.6	1325	48.7	10.4
25	23	Ciba-Geigy	1,290	0.3	65.1	Specialty chemicals	na	na	na	na	na	na	na
26	28	American Hoechst	1,222[e]	3.0	75.2	Basic chemicals	na	na	na	na	na	na	na
27	27	Ashland Oil	1,208	0.9	14.9	Petroleum	1	−96.4	0.5	0.1	423	10.3	0.2
28	40	Occidental Petroleum	1,137[h]	−10.1	5.8	Petroleum	−12	def	def	def	985	8.4	def
28	26	Texaco	1,137	−6.1	2.8	Petroleum	−65	def	def	def	895	3.3	def
30	34	B. F. Goodrich	1,133	11.6	35.5	Rubber products	44	3927.3	43.9	3.9	1214	47.1	3.6
30	29	Unocal Corp.	1,133	−1.7	10.7	Petroleum	74[g]	−17.3	11.8	6.5	699	7.6	10.6
32	31	U.S. Steel	1,128	4.7	6.4	Steel	−27	def	def	def	1130	5.9	def
33	36	Olin	1,111	9.7	57.4	Basic chemicals	68	21.5	44.9	6.1	1002	54.8	6.8
34	32	Standard Oil of Calif.	1,059	1.1	3.7	Petroleum	−12[g]	def	def	def	780	3.8	def
35	38	BASF Wyandotte	1,034	15.6	100.0	Basic chemicals	20	def	100.0	1.9	726	100.0	2.7
36	35	International Minerals[i]	997	−1.6	68.2	Agrichemicals	156	−7.6	81.1	15.7	1377	70.8	11.4
37	33	Diamond Shamrock	942	−9.0	23.4	Petroleum	12	−83.2	def	1.3	1063	17.6	1.1
38	39	PPG Industries	882	−1.2	24.0	Glass products	51	30.8	11.8	5.8	1152	31.9	4.4
39	37	CF Industries	862[e]	−6.2	100.0	Agrichemicals	34	def	100.0	4.0	1013	100.0	3.4
40	52	Borg-Warner	826	34.8	23.5	Auto equipment	110	112.7	35.2	13.3	365	13.9	30.2
41	41	Lubrizol	800	−1.5	100.0	Specialty chemicals	109	5.1	100.0	13.6	683	100.0	15.9
42	44	National Distillers	785	14.6	30.3	Alcoholic beverages	68	86.5	41.6	8.6	683	34.6	9.9
43	46	Dow Corning	763	15.1	100.0	Specialty chemicals	68[g]	29.1	100.0	9.0	na	na	na
44	43	Reichhold Chemicals	747	−5.0	100.0	Basic chemicals	35	137.9	100.0	4.6	371	96.4	9.3
45	40	Williams Cos.	740	−10.7	34.1	Agrichemicals	1	def	0.6	0.1	894	19.1	0.1
46	42	Eli Lilly	727	−7.8	24.0	Drugs	98	−33.4	12.4	13.5	793	837.8	12.3
47	51	Georgia-Pacific	683	8.8	10.6	Wood products	64	−16.9	61.0	9.4	1023	20.5	6.3
48	57	Badische	671	33.9	100.0	Basic chemicals	30	def	100.0	4.4	513	100.0	5.7
49	47	Nalco Chemical	659	2.4	100.0	Specialty chemicals	118	19.0	100.0	17.8	489	100.0	24.0
50	49	Merck	606	−5.1	18.7	Drugs	52	−11.7	7.3	8.6	592	14.0	8.8

a Revised. b Operating profit defined as sales less administrative expense and cost of sales. c Operating profit from chemicals as a percentage of chemical sales. d Operating profit as a percentage of identifiable chemical assets. e Chemical sales include significant amounts of nonchemical products. f Fiscal year ends Sept. 30. g Chemical net profits. h Does not include all chemical products.

for more than a third of their total sales volume

Rank 1983	Rank 1982[a]		Chemical sales 1983 ($ millions)	Change from 1982	Chemical sales as % of total sales	Industry classification	Chemical operating profits[b] 1983 ($ millions)	Change from 1982	Chemical operating profits as % of total operating profits	Operating profit margin[c]	Chemical assets 1983 ($ millions)	Chemical assets as % of total assets	Operating return on chemical assets[d]
51	53	Pennwalt	$605	4.2%	62.0%	Basic chemicals	$ 43	−7.1%	58.1%	7.1%	$463	53.1%	9.3%
52	56	Uniroyal	593	15.0	29.1	Rubber products	65	54.9	40.6	11.0	465	31.3	14.0
53	48	Kaiser Aluminum	582	−9.3	20.4	Nonferrous metals	24	−43.9	def	4.2	488	13.9	5.0
54	50	Esmark[j]	580[e]	−7.8	14.1	Food	29	25.6	11.0	5.1	347	11.1	8.5
55	58	Witco Chemical	571	11.3	41.2	Specialty chemicals	54	40.2	36.2	9.5	276	37.7	19.6
56	54	Standard Oil (Ohio)	566	2.2	4.7	Petroleum	−3	def	def	def	642	3.9	def
57	55	Koppers	555[e]	3.7	35.4	Diversified	7	−14.8	8.4	1.3	316	26.9	2.3
58	45	Farmland Industries	542	−18.4	11.5	Agricultural supplies	−55	def	def	def	447	26.2	def
59	63	National Starch	508	8.8	67.1	Specialty chemicals	na	na	na	na	na	na	na
60	61	NL Industries	470	−1.4	33.8	Petroleum services	63	4.7	def	13.4	317	16.5	19.8
61	56	Sun Co.	467	−9.5	3.0	Petroleum	na	na	na	na	na	na	na
62	64	International Flavors	461	2.9	100.0	Specialty chemicals	111	9.3	100.0	24.0	432	94.2	25.6
63	62	Cabot[j]	460	−2.4	29.5	Specialty metals	44	−29.8	26.5	9.5	259	19.8	16.9
64	67	Beatrice Foods	453	8.1	20.3	Food	66	32.0	8.2	14.6	na	na	na
65	—	Morton Thiokol[l]	448	132.0	29.7	Diversified	47	168.2	27.3	10.5	533	46.3	8.9
66	65	Freeport-McMoRan	441	1.2	56.0	Agricultural chemicals	74	−21.0	52.0	16.8	235	16.6	31.6
67	60	Kerr-McGee	439	−10.1	12.5	Petroleum	−27	def	def	def	630	16.5	def
68	66	Polysar	436	1.5	100.0	Basic chemicals	na	na	na	na	na	na	na
69	72	H. B. Fuller[k]	426	28.2	100.0	Specialty chemicals	33	31.6	100.0	7.8	226	100.0	14.7
70	68	Henkel	400	1.5	100.0	Specialty chemicals	na	na	na	na	na	na	na
71	69	Pfizer	394	0.9	10.5	Drugs	5	def	0.7	1.3	394	10.0	1.3
72	70	Liquid Air	390	5.1	84.8	Basic chemicals	49	2.1	104.1	12.5	465	86.8	10.5
73	71	InterNorth	374	9.9	7.5	Natural gas	27	146.3	5.3	7.1	404	8.1	6.6
74	76	GAF	323	9.8	46.2	Specialty chemicals	65	16.4	211.1	20.0	198	47.8	32.6
75	84	American Petrofina	310	23.2	15.0	Petroleum	5	def	6.1	1.7	178	12.7	2.9
76	78	Houston Natural Gas[l]	305	9.9	10.3	Natural gas	34	7.0	10.8	11.0	387	14.2	8.7
77	74	Tyler	304	0.8	31.6	Diversified chemicals	22	51.7	31.7	7.2	158	31.6	13.9
78	85	Soltex	300	20.0	100.0	Basic chemicals	na	na	na	na	na	na	na
79	77	Big Three Industries	294	3.6	43.9	Petroleum services	71	−11.2	67.5	24.1	538	49.0	13.1
80	81	Upjohn	291	8.6	15.9	Drugs	−21	def	def	def	180	10.2	def
81	75	Rhône-Poulenc	290	−3.3	100.0	Specialty chemicals	na	na	na	na	na	na	na
82	87	Engelhard	273	10.2	24.9	Specialty metals	56	13.4	49.9	20.4	264	30.4	21.1
83	79	Petrolite[j]	267	−3.0	92.7	Specialty chemicals	33	−24.6	97.6	12.3	153	73.1	21.5
84	73	Mississippi Chemical[l]	263	−19.3	100.0	Farm cooperative	4	1333.3	100.0	1.6	343	100.0	1.3
85	83	Emhart	259	2.2	15.3	Machinery	24	2.6	15.6	9.2	113	11.1	21.1
86	82	Vulcan Materials	256	−2.7	31.2	Nonmetallic minerals	15	−67.3	16.4	5.7	na	na	na
87	91	Baker Industries	253	20.2	100.0	Agricultural chemicals	1	def	100.0	0.4	327	100.0	0.3
88	88	Chemed	252	9.4	92.8	Specialty chemicals	35	10.5	92.3	13.8	134	67.9	26.0
89	86	SCM[j]	251[e]	0.8	15.1	Paint	15	−32.6	16.5	6.0	267	24.0	5.7
90	80	Terra Chemicals	247	−9.5	100.0	Agricultural chemicals	na	na	na	na	173	100.0	na
91	93	Aluminum Co. of America	241	17.0	4.6	Nonferrous metals	na	na	na	na	na	na	na
92	94	Ferro	240[e]	16.9	38.8	Specialty materials	17	107.1	32.5	7.2	77	20.9	22.7
93	98	Great Lakes Chemical	226	33.2	100.0	Specialty chemicals	39	53.1	100.0	17.3	227	100.0	17.3
94	90	Loctite	216	−0.3	100.0	Specialty chemicals	29	17.3	100.0	13.5	213	100.0	13.7
95	89	Martin Marietta	214	−3.8	5.5	Aerospace	35	84.2	13.0	16.4	197	7.2	17.7
96	92	Stepan Chemical	207	−0.6	100.0	Specialty chemicals	11	20.7	100.0	5.4	145	100.0	7.7
97	—	Essex Chemical	169	11.2	100.0	Basic chemicals	17	−23.0	100.0	9.9	116	79.8	14.4
98	95	Agway	162	−16.0	4.3	Farm cooperative	na	na	na	na	na	na	na
99	—	UGI Corp.	149	−21.2	22.3	Natural gas	0	def	def	def	117	21.0	def
100	—	Sterling Drug	136	2.3	7.2	Diversified	7	56.5	2.8	5.3	112	7.6	6.4

j Fiscal year ends June 30. k Fiscal year ends Oct. 31. k Fiscal year ends Nov. 30. l Fiscal year ends July 31. na = not available. nm = not meaningful. def = deficit.

SHIPMENTS: Chemical industry sales grew more than those of industry as a whole in 1983

$ Billions	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Annual change 1982–83	Annual change 1973–83
All manufacturing industries	$2052.8	$1910.1	$1994.6	$1851.0	$1727.2	$1523.4	$1358.4	$1185.6	$1039.1	$1017.5	$875.2	7%	9%
Chemicals and allied products	189.2	172.8	175.1	161.6	147.7	129.8	118.2	104.1	89.7	83.7	65.0	9	11
Industrial chemicals[a]	59.9	55.8	60.7	56.4	52.3	44.8	41.5	35.6	29.4	26.6	19.0	7	12
Drugs, soap, and toiletries	48.8	48.6	44.1	41.9	36.7	34.7	30.6	27.8	24.3	22.2	19.3	0	10
Petroleum and coal products	191.0	206.4	220.3	198.7	148.4	103.9	97.5	82.3	69.5	58.9	34.9	−7	19
Rubber and plastic products, nec	51.9	50.2	46.5	47.3	46.8	43.2	39.6	31.8	27.2	27.9	24.4	3	8
Paper and allied products	85.7	79.0	79.5	72.6	65.2	57.0	52.1	48.2	41.7	41.8	32.8	8	10

a Excluding pigments. **nec** = not elsewhere classified. **Source:** Department of Commerce

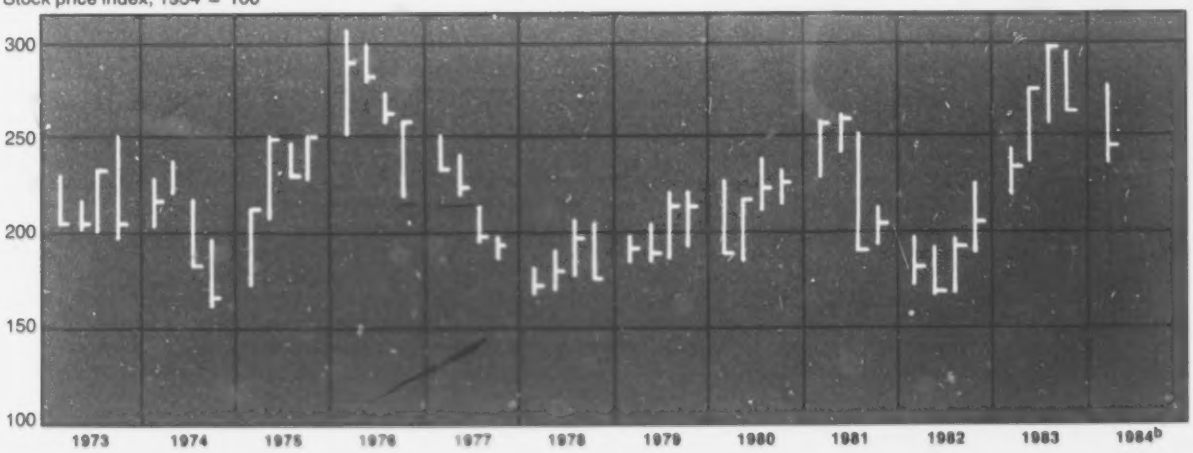
PRICES: Little or no increases in most chemical industry sectors

Producer price indexes,[a] 1967 = 100	Annual average 1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Annual change 1982–83	Annual change 1973–83
All commodities	303.1	299.3	293.4	268.8	235.6	209.3	194.2	183.0	174.9	160.1	134.7	1%	8%
Industrial commodities	315.8	312.3	304.1	274.8	236.5	209.4	195.1	182.4	171.5	153.8	125.9	1	10
Chemicals and allied products	292.9	292.4	287.6	260.3	222.3	198.8	192.8	187.2	181.3	146.8	110.0	0	10
Industrial chemicals	342.9	353.0	363.3	324.0	264.0	225.6	223.9	219.3	206.9	151.7	103.4	−3	13
Prepared paint	264.7	262.9	249.8	235.3	204.4	192.3	182.4	174.4	166.9	145.7	122.2	1	8
Paint materials	305.6	304.6	300.1	273.9	241.2	212.7	205.9	189.8	177.2	152.3	113.2	0	10
Drugs and pharmaceuticals	226.2	210.1	193.5	174.5	159.4	148.1	140.5	134.0	126.6	112.7	104.3	8	8
Fats and oils, inedible	283.7	267.1	295.6	298.0	376.7	315.8	279.0	249.9	255.2	338.2	228.3	6	2
Agricultural chemicals and chemical products	280.7	292.7	285.0	257.1	214.4	198.4	187.8	188.4	203.6	137.7	96.6	−4	11
Plastic resins and materials	290.2	283.3	289.2	279.2	235.9	199.8	195.7	194.0	180.9	143.8	92.1	2	12
Other chemicals and allied products	273.4	269.8	254.2	224.5	191.8	181.8	175.7	170.7	168.6	147.5	118.1	1	9
Rubber and plastics products	243.4	241.6	232.6	217.4	194.3	174.8	167.6	159.2	150.2	136.2	112.4	1	8

a Formerly called "wholesale price indexes." **Source:** Department of Labor

Recovery in chemical stock prices peaked in third-quarter 1983

Stock price index, 1954 = 100[a]



a C&EN weighted stock price index of Allied Corp., American Cyanamid, Celanese, Dow Chemical, Du Pont, Monsanto, and Union Carbide; weighted according to number of shares outstanding for each company. b First quarter

INDUSTRY BALANCE SHEET: Liquidity is higher but assets and liabilities change little overall

Industrial chemicals and synthetics

Assets	1983 ($ billions)	1982 ($ billions)	Change
Current assets:			
Cash and time deposits in U.S.	$ 1.29	$ 1.04	23%
Marketable securities	1.68	1.36	24
Receivables	14.12	13.26	6
Inventories	11.70	12.43	−6
Other current assets	2.48	2.77	−10
Total	**31.27**	**30.86**	**1**
Fixed assets:			
Plant, property, and equipment	83.04	80.15	4
Less: accumulated depreciation and depletion	38.46	35.59	8
Net fixed assets	**44.58**	**44.56**	**0**
Other assets, including investments and intangibles	**17.50**	**17.54**	**0**
TOTAL ASSETS	**$93.34**	**$92.95**	**0%**

Liabilities and stockholders' equity	1983 ($ billions)	1982 ($ billions)	Change
Current liabilities			
Accounts payable	$ 6.83	$ 6.28	9%
Short-term loans	1.76	1.78	−1
Accrued income taxes	1.25	0.50	151
Current portion of long-term debt	1.12	0.91	24
Other current liabilities	8.94	8.53	5
Total	**19.91**	**18.00**	**11**
Long-term debt	**19.54**	**22.04**	**−11**
Deferred taxes, minority interest, and other noncurrent liabilities	**8.17**	**6.97**	**17**
TOTAL LIABILITIES	**47.62**	**47.01**	**1**
Stockholders' equity			
Capital stock and other capital	17.84	17.85	0
Retained earnings	27.88	28.10	−1
TOTAL STOCKHOLDERS' EQUITY	**45.72**	**45.95**	**0**
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	**$93.34**	**$92.95**	**0%**

Note: Totals may not add because of rounding. **Source:** Bureau of the Census

DEBT RATIOS: Down moderately last year for the chemical industry

$ Billions	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
INDUSTRIAL CHEMICALS AND SYNTHETICS											
Long-term debt	$19.5	$22.0	$21.4	$16.8	$14.8	$13.6	$12.3	$11.8	$10.2	$ 7.8	$ 7.2
Stockholders' equity	$45.7	$45.9	$42.5	$39.8	$32.3	$29.3	$26.3	$25.0	$22.8	$20.5	$18.7
Debt ratio[a]	29.9%	32.4%	33.5%	29.6%	31.4%	31.8%	31.9%	32.0%	30.8%	27.6%	27.8%
CHEMICALS AND ALLIED PRODUCTS											
Long-term debt	$36.2	$38.2	$36.9	$28.3	$24.9	$23.5	$21.1	$19.4	$16.8	$12.8	$10.7
Stockholders' equity	$97.6	$95.3	$89.9	$79.5	$67.4	$60.8	$54.9	$50.8	$45.7	$40.9	$36.7
Debt ratio[a]	27.1%	28.6%	29.1%	26.3%	27.0%	27.9%	27.8%	27.6%	26.9%	23.8%	22.6%
ALL MANUFACTURING											
Long-term debt	$287.1	$293.1	$266.5	$236.2	$204.8	$182.0	$167.3	$153.6	$145.2	$130.1	$112.9
Stockholders' equity	$835.0	$783.0	$762.3	$699.7	$624.0	$560.8	$511.7	$475.3	$435.5	$408.4	$368.0
Debt ratio[a]	25.6%	27.2%	25.9%	25.2%	24.7%	24.5%	24.6%	24.4%	25.0%	24.2%	23.5%

a Long-term debt as a percentage of long-term debt plus stockholders' equity. **Note:** Because of changes in accounting rules and industry classifications, numbers over the entire range of years are not strictly comparable. **Source:** Bureau of the Census

CASH FLOW: Smaller shares of funds are provided by debt and consumed by capital outlays

$ Millions, % of total	1983		1982		1981		1980		1979	
SOURCES OF FUNDS										
Net income	$ 2,735	21.5%	$ 2,347	19.4%	$ 3,629	17.1%	$ 3354	33.9%	$3476	39.6%
Depreciation and depletion	4,633	36.4	4,346	36.0	3,633	17.1	3275	33.1	3129	35.6
Deferred taxes	362	2.8	570	4.7	906	4.3	603	6.1	422	4.8
Other internal sources	2,592	20.4	1,841	15.2	1,308	6.1	496	5.0	672	7.6
Long-term debt	1,899	14.9	2,554	21.1	7,190	33.9	1892	19.1	992	11.3
Stock	514	4.0	427	3.5	4,567	21.5	282	2.8	99	1.1
TOTAL	**$12,734**	**100.0%**	**$12,085**	**100.0%**	**$21,233**	**100.0%**	**$9902**	**100%**	**$8790**	**100.0%**
APPLICATIONS OF FUNDS										
Dividends	$ 1,754	13.8%	$ 1,682	13.9%	$ 1,569	7.4%	$ 1368	13.8%	$1287	14.6%
Capital expenditures	5,619	44.1	7,192	59.5	6,975	32.9	5867	59.3	4728	53.8
Additions to working capital	−343	−2.7	−1,548	−12.8	3,576	16.8	648	6.5	1033	11.8
Reduction of long-term debt	3,380	26.6	3,398	28.1	1,081	5.1	968	9.8	808	9.2
Other applications	2,324	18.2	1,361	11.3	8,032	37.8	1050	10.6	934	10.6
TOTAL	**$12,734**	**100.0%**	**$12,085**	**100.0**	**$21,233**	**100.0%**	**$9902**	**100.0%**	**$8790**	**100.0%**

Note: Data are totals for 12 major chemical companies: American Cyanamid, Celanese, Dow Chemical, Du Pont, Ethyl, Hercules, Monsanto, Olin, Pennwalt, Rohm & Haas, Union Carbide, and Williams Cos. **Source:** Company annual reports

FINANCIAL ANALYSIS: In 1983, most analytical measures strengthened moderately

		Profit margin[a]	Return on investment[b]	Debt as % debt plus equity	% total sales abroad[c]	% total assets abroad[d]	Sales per employee[e]	Dividends as % of net income	CAPITAL SPENDING[f] as % of sales	CAPITAL SPENDING[f] as % of net plant	R&D as % of sales	Sales as % of assets	Net plant as % of gross plant
SALES OVER $1 BILLION													
Air Products[g]	1983	6.7%	3.5%	28.3%	19.3%	17.8%	$ 98	25.4%	15.1%	16.0%	2.4%	73.6%	59.0%
	1982	6.7	3.5	36.1	28.5	18.6	83	21.9	22.1	23.2	2.4	71.1	61.5
American Cyanamid	1983	4.7	4.0	24.5	32.4	23.9	91	51.3	4.7	13.1	6.1	115.7	47.9
	1982	3.8	3.3	24.7	35.3	26.5	86	63.7	5.0	13.2	5.5	115.2	51.7
Celanese	1983	3.6	2.5	39.7	22.0	25.1	140	56.3	3.2	7.3	2.7	113.7	38.9
	1982	0.2	0.1	41.7	23.3	22.8	121	1340.0	9.0	17.1	3.3	107.0	43.0
Dow Chemical	1983	2.5	1.7	35.7	52.3	45.4	201	128.9	5.8	11.1	4.5	91.4	49.4
	1982	3.2	2.3	41.0	52.2	45.4	188	101.8	7.8	13.9	4.3	89.9	53.2
Ethyl	1983	6.6	6.8	25.6	15.5	11.1	134	31.7	4.9	13.5	2.3	115.6	51.9
	1982	5.7	5.5	30.9	16.4	11.1	115	36.6	5.7	13.8	2.4	106.0	55.0
W. R. Grace	1983	2.6	2.6	38.2	20.0	14.5	79	85.3	5.7	13.0	1.1	123.5	61.8
	1982	5.2	5.4	37.0	20.8	16.2	75	40.9	9.1	20.7	1.0	124.5	64.3
Hercules	1983	5.7	5.8	21.4	21.0	15.4	109	44.1	6.4	21.2	2.8	120.9	45.5
	1982	3.7	3.3	28.1	22.5	21.5	107	59.8	6.6	18.3	2.8	124.8	44.7
International Minerals[h]	1983	5.4	3.1	29.3	20.4	9.4	176	86.2	8.1	10.1	na	76.1	59.6
	1982	7.5	4.9	30.4	21.7	9.1	194	56.5	9.9	13.7	na	83.9	63.3
Monsanto	1983	6.2	4.1	20.4	27.0	18.2	124	43.8	8.9	17.1	4.6	98.0	49.5
	1982	5.4	3.8	22.3	29.1	19.9	124	46.5	10.6	20.3	4.2	104.1	50.7
Morton Thiokol	1983	5.2	6.7	21.3	15.3	16.4	90	30.1	4.7	13.6	1.5	131.1	72.8
	1982	6.2	5.5	15.3	20.2	15.3	112	42.5	4.8	18.3	1.0	105.4	56.3
National Distillers	1983	2.6	3.1	25.9	na	na	na	121.0	2.8	9.1	na	131.2	59.2
	1982	4.3	4.5	18.0	na	na	na	101.9	3.6	13.4	na	107.2	52.0
Olin	1983	3.7	2.6	31.3	7.3	9.9	106	40.9	6.3	14.4	2.6	105.8	44.1
	1982	2.9	2.1	26.7	6.1	10.2	104	53.1	7.6	16.5	2.6	111.4	47.2
PPG Industries	1983	6.3	4.7	21.1	22.1	22.6	100	36.9	12.2	20.5	3.5	101.9	59.6
	1982	4.7	3.5	21.5	22.5	20.6	89	52.4	13.7	22.6	3.9	100.8	59.5
Rohm & Haas	1983	7.5	6.4	20.1	35.4	24.6	165	27.4	3.8	13.8	5.4	124.1	38.6
	1982	4.1	3.7	22.9	37.1	27.3	158	48.1	6.9	23.0	5.0	133.9	42.1
Stauffer Chemical[i]	1983	def	def	24.8	20.3	10.9	138	def	7.7	9.2	4.7	65.4	57.8
	1982	8.2	4.7	28.3	16.9	9.8	148	46.5	10.9	14.7	3.8	73.9	60.6
Union Carbide	1983	2.8	1.8	32.6	31.2	30.3	90	96.3	8.5	12.1	2.7	87.4	58.7
	1982	3.4	2.2	32.0	33.2	30.1	88	75.8	13.0	18.5	2.6	85.4	58.9
Williams Cos.	1983	2.5	1.1	60.4	na	na	112	67.0	11.7	7.9	na	46.2	79.0
	1982	1.8	1.0	39.1	na	na	94	120.2	10.2	11.4	na	71.4	66.7
Witco Chemical	1983	3.8	5.4	30.4	14.6	13.7	na	34.8	3.2	14.3	na	189.1	53.4
	1982	2.3	3.5	33.1	14.2	13.8	na	57.0	4.1	18.5	na	197.3	54.7
MEDIAN 1983		**3.8%**	**3.3%**	**27.1%**	**20.7%**	**17.1%**	**$111**	**43.5%**	**7.6%**	**13.3%**	**2.8%**	**109.8%**	**55.6%**
MEDIAN 1982		**4.5%**	**3.5%**	**29.4%**	**22.9%**	**19.3%**	**$114**	**52.8%**	**8.4%**	**17.7%**	**3.1%**	**105.7%**	**55.7%**

a Net income as a percentage of sales. b Net income as a percentage of current assets plus gross plant. c Consolidated sales only. d Foreign identifiable assets as a percentage of total assets. e Thousands of dollars. f Actual spending on construction of new facilities and purchase of new equipment and land in consolidated businesses. g For fiscal year ended Sept. 30, 1983. h For fiscal year ended June 30, 1983. i Stauffer has changed its fiscal year to end Nov. 30. Figures for 1982 are for calendar year ended Dec. 31, so some double counting is involved.

		Profit margin[a]	Return on investment[b]	Debt as % debt plus equity	% total sales abroad[c]	% total assets abroad[d]	Sales per employee[e]	Dividends as % of net income	CAPITAL SPENDING[f] as % of sales	CAPITAL SPENDING[f] as % of net plant	R&D as % of sales	Sales as % of assets	Net plant as % of gross plant
SALES LESS THAN $1 BILLION													
Baker Industries	1983	0.4%	0.3%	52.2%	na	na	$297	0.0%	3.8%	5.5%	na	77.3%	68.5%
	1982	def	def	53.4	na	na	na	def	8.8	10.3	na	69.1	72.0
Chemed	1983	6.4	12.1	44.6	13.4%	11.2%	na	62.6	2.1	16.3	0.9%	137.9	62.4
	1982	6.7	14.0	58.2	14.9	13.7	na	81.0	2.0	16.2	0.9	149.5	63.1
Crompton & Knowles	1983	2.7	4.6	24.6	19.3	21.2	na	61.9	1.3	19.5	1.9	182.6	56.6
	1982	2.4	3.8	24.4	21.6	23.0	na	75.0	1.7	10.8	2.0	165.1	61.2
Essex Chemical	1983	2.9	2.9	59.1	na	na	187	55.1	6.4	16.2	1.8	116.0	66.2
	1982	4.7	4.6	61.0	na	na	160	33.3	17.2	44.4	1.6	110.4	66.3
First Mississippi[h]	1983	6.9	3.4	35.3	na	na	251	34.8	23.2	23.6	na	53.8	64.4
	1982	10.4	5.8	24.5	na	na	na	21.4	30.4	36.9	na	56.5	67.9
Freeport-McMoRan	1983	11.5	4.6	27.2	na	na	164	47.3	29.6	21.3	na	55.4	62.6
	1982	11.1	3.9	39.6	na	na	150	50.4	64.2	36.4	na	45.1	68.4
H. B. Fuller[i]	1983	3.2	5.6	36.0	39.0	50.9	104	18.1	3.5	18.3	2.0	188.4	67.0
	1982	2.6	3.8	35.1	32.6	52.6	83	27.9	5.1	22.9	2.1	160.1	68.5
Great Lakes	1983	10.5	8.5	15.1	19.9	na	na	0.7	10.4	19.3	3.4	99.5	63.9
	1982	9.7	6.7	21.9	16.5	na	na	0.9	20.5	30.6	3.5	84.0	66.7
International Flavors	1983	14.8	12.7	0.0	65.6	48.5	125	56.1	5.8	19.2	6.9	100.6	59.3
	1982	14.1	12.4	0.0	67.0	51.7	124	59.0	6.3	20.9	6.8	103.8	58.8
Lawter International	1983	15.9	16.1	8.1	31.3	37.6	na	59.4	3.7	15.6	1.8	119.0	59.4
	1982	12.5	13.2	1.8	34.6	39.4	na	82.0	5.4	20.9	1.8	125.0	61.7
Liquid Air	1983	5.2	3.4	31.5	34.7	35.9	113	89.5	9.1	11.7	1.8	85.8	60.5
	1982	6.1	4.0	33.0	38.3	37.4	na	76.4	13.1	16.6	1.5	83.6	64.0
Loctite[h]	1983	7.9	8.2	10.8	40.5	45.0	92	32.7	4.6	21.3	2.8	101.3	66.4
	1982	7.3	7.7	11.5	42.6	45.3	87	34.8	5.0	24.5	2.6	108.3	68.5
Lubrizol	1983	8.1	7.5	5.5	52.3	36.5	192	65.4	3.1	9.1	4.6	117.2	54.7
	1982	5.9	6.0	4.0	50.3	38.5	188	88.9	6.4	17.9	4.4	126.2	58.8
Nalco Chemical	1983	10.8	11.5	5.0	21.0	21.0	143	63.9	6.1	21.1	4.5	134.8	49.3
	1982	10.0	11.1	4.8	21.3	24.1	140	68.9	8.7	28.9	5.2	138.5	52.7
Pennwalt	1983	4.6	3.9	26.9	18.6	12.4	100	61.2	7.1	20.0	3.4	111.9	51.2
	1982	2.6	2.4	31.3	19.1	15.6	100	95.1	8.0	22.3	3.2	125.9	52.0
Petrolite[k]	1983	7.7	7.7	5.5	19.5	15.1	na	53.8	3.2	12.3	4.0	137.7	48.2
	1982	9.7	11.0	6.6	20.9	18.2	na	38.6	7.8	29.5	3.1	151.1	53.3
Reichhold Chemicals	1983	2.7	4.2	21.6	11.1	11.4	na	31.3	2.6	11.0	2.2	194.2	59.3
	1982	0.9	1.5	25.8	16.8	13.1	na	91.3	2.6	12.9	2.2	214.4	58.1
Stepan Chemical	1983	3.0	3.3	27.1	na	na	235	33.3	4.7	12.9	3.4	142.8	55.9
	1982	2.5	2.8	31.4	na	na	227	37.7	7.7	21.3	3.2	127.9	59.4
MEDIAN 1983		**6.7%**	**5.2%**	**25.8%**	**21.0%**	**36.2%**	**$154**	**54.5%**	**4.7%**	**16.3%**	**2.8%**	**116.6%**	**60.0%**
MEDIAN 1982		**6.4%**	**5.2%**	**25.2%**	**21.6%**	**30.8%**	**$140**	**61.2%**	**7.8%**	**21.8%**	**2.6%**	**125.5%**	**62.4%**

j For fiscal year ended Nov. 30, 1983. k For fiscal year ended Oct. 31, 1983. **Note:** Net income is from continuing operations, excluding extraordinary and nonrecurring items where possible. **na** = not available. **def** = deficit.

INDUSTRY CAPITAL SPENDING: Increase budgeted for chemicals and allied products

$ Billions	1984[a]	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
Chemicals	$ 14.34	$ 13.28	$ 13.27	$ 13.60	$ 12.60	$10.78	$ 8.46	$ 8.14	$ 8.12	$ 7.63	$ 6.48
Iron and steel	3.27	2.97	3.47	3.17	3.29	3.09	2.52	2.79	3.04	3.03	1.94
Nonferrous metals	2.73	2.44	2.71	3.46	3.11	2.39	2.11	1.88	1.97	2.18	2.04
Paper	7.13	6.18	5.97	6.72	6.80	5.55	3.99	3.59	3.11	2.98	2.90
Petroleum	26.51	23.48	26.69	26.56	20.69	16.21	13.95	12.70	10.76	9.59	7.31
Rubber	2.21	1.91	1.71	1.77	1.73	2.17	2.10	1.66	1.32	1.15	1.56
Stone, clay, glass	2.81	2.45	2.61	3.14	3.82	3.94	3.10	2.23	1.88	1.67	1.64
All manufacturing	129.72	111.53	119.68	126.79	115.81	98.68	79.72	69.22	59.95	54.92	53.21

a Estimate. **Source:** Department of Commerce

Backlog of unspent capital funds changed little for chemical industry in 1983

$ Billions	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Chemicals	$ 7.5	$ 7.4	$ 9.4	$ 9.8	$ 8.5	$ 7.2	$ 7.4	$ 7.1	$ 6.9	$ 6.6	$ 4.9
Iron and steel	2.2	2.7	5.4	3.9	4.5	4.0	3.6	4.7	5.4	5.8	2.4
Nonferrous metals	3.2	3.2	3.7	3.7	2.9	2.7	2.9	2.4	2.2	2.7	2.2
Paper	4.0	5.1	5.1	4.0	4.2	3.2	2.6	2.0	2.7	2.9	1.7
Petroleum, coal	22.3	22.9	29.7	26.7	16.1	14.6	15.0	12.2	14.1	12.8	7.1
Rubber	1.1	1.0	0.9	1.0	0.9	0.9	0.8	0.7	0.6	0.7	0.9
Stone, clay, glass	1.5	1.6	1.9	2.0	2.3	2.4	2.0	1.5	1.4	1.7	1.5
All manufacturing	73.7	70.8	92.7	91.9	76.7	63.4	56.5	47.5	46.4	49.8	37.1

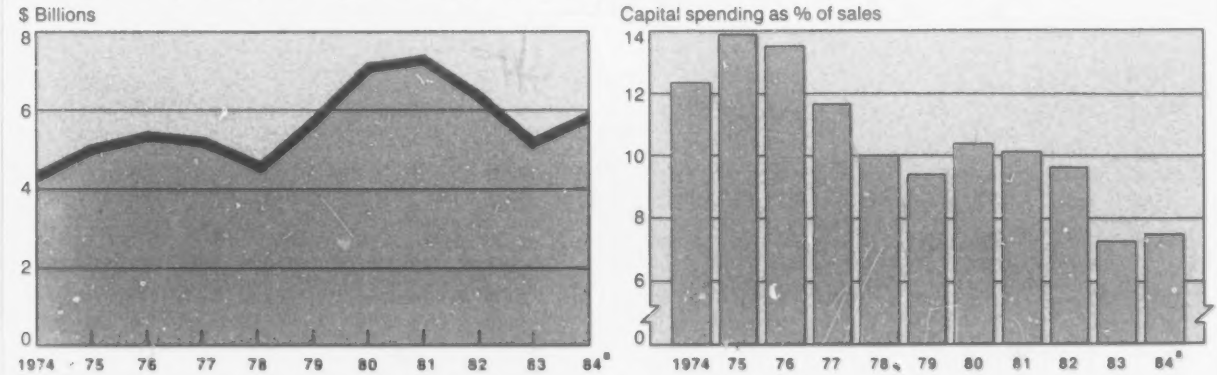
Note: Figures are for fourth quarter of each year. **Source:** Conference Board

U.S. chemical firms plan small rise in overseas investment

$ Billions[a]	1984[b]	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
Chemicals and allied products	$ 2.9	$ 2.5	$ 2.8	$ 3.0	$ 3.0	$ 2.6	$ 1.9	$ 2.0	$ 2.7	$ 2.5	$ 2.1
Metals, primary and fabricated	1.1	0.8	0.9	0.8	0.9	0.6	0.6	0.5	0.7	0.7	0.7
Petroleum	19.4	17.5	19.7	15.8	14.8	11.0	9.5	8.9	7.9	8.9	7.8
All manufacturing	16.0	13.8	16.8	19.2	19.5	15.4	12.0	10.5	10.9	11.3	11.6

a By majority-owned foreign affiliates of U.S. companies; data after 1976 are not consistent with earlier years. b Planned. **Source:** Department of Commerce

Chemical capital spending, although up a bit this year, remains low relative to sales



a Planned. **Source:** Worldwide data for 14 major U.S. basic chemical companies

Capital spending in the chemical industry is once again on the increase. But that increase is tempered somewhat by the realities of the marketplace.

Capacity utilization rates are still relatively low compared with historic rates and so do not justify increased spending on new plant and equipment. And a prime lending rate of around 13% is causing companies to look twice in comparing the cost of capital to the expected rate of return for new capacity.

Thus, this year, much of the capital spending that is taking place is for upgrading and modernizing existing plants. Chemical makers are improving operating efficiencies and, in many cases, they are increasing capacity by doing so.

Then, too, this type of capital spending, which is less expensive than building new plants, allows companies to obtain their capital funds from their own internal cash flow. This is helping to keep them away from credit markets.

The high cost of money also is discouraging a massive buildup in plant, as happened in previous recoveries to eventually dampen capacity utilization throughout the late 1970s.

An update of C&EN's annual survey of worldwide capital spending by 14 major chemical companies shows that spending on plant and equipment will rise about 15% in 1984 to almost $5.9 billion from 1983. Although this seems like a large increase, it follows a 21% decline in 1983. Thus, 1984 planned spending is still 10% below 1982 levels of almost $6.5 billion. This means capital spending will be about 7.5% of sales in 1984, compared to 7.3% in 1983 but 9.6% in 1982.

C&EN's survey of the 14 companies shows an average spending increase that is much higher than that shown by the Commerce Department in its survey of planned capital spending. In the government's latest survey, capital spending in the much broader chemicals and allied products category is forecast to rise 8% to $14.3 billion from 1983. The Commerce Department, though, shows practically no change between 1982 and 1983, compared to the decline shown by C&EN's figures.

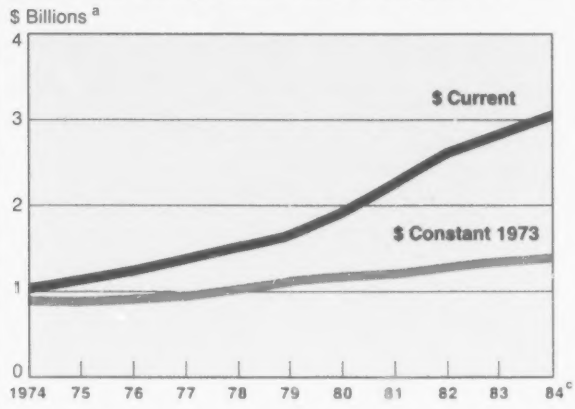
The Commerce Department also is forecasting a resurgence of overseas spending by majority-owned foreign affiliates of U.S. companies, following a two-year decline. Overseas spending for chemicals and allied products, according to the latest government figures, will rise 15% in 1984 to $2.9 billion. The 1983 figure was off 11% from $2.8 billion in 1982.

CHEMICAL CAPITAL SPENDING: Most companies increase budgets after two years of cuts

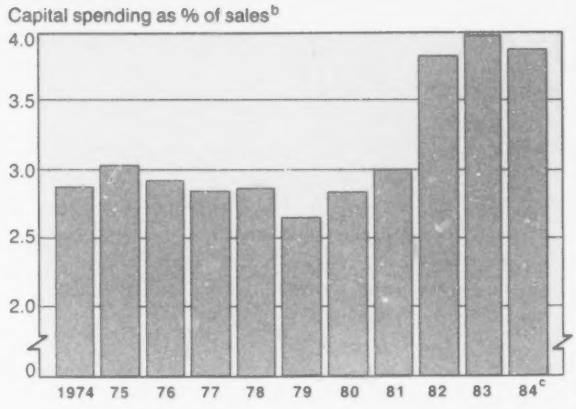
$ Millions	1984[a]	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
Air Products	$ 300	$ 246	$ 347	$ 323	$ 364	$ 246	$ 200	$ 143	$ 162	$ 151	$ 110
American Cyanamid	190	165	171	181	196	235	251	235	232	204	139
Celanese	175	105	275	414	253	245	248	243	223	208	220
Dow Chemical	750	630	829	1176	1184	1268	1075	1163	1200	935	890
Du Pont[b]	1500	1276	1300	1420	1297	864	714	704	876	1036	1008
Ethyl	95	85	92	141	156	123	96	88	88	69	75
Grace	450	353	560	657	658	514	313	279	234	309	303
Hercules	200	168	174	167	229	186	116	127	150	151	217
Monsanto	600	560	673	668	781	566	480	607	647	528	313
Olin	175	123	139	186	172	161	163	208	166	99	67
PPG Industries	400	450	452	376	401	252	261	212	177	176	205
Rohm & Haas	130	72	126	182	93	68	66	79	110	106	106
Stauffer Chemical	130	104	177	239	246	239	201	193	199	199	83
Union Carbide	775	761	1179	1186	1129	831	688	805	965	862	517
TOTAL	$5870	$5097	$6493	$7316	$7159	$5798	$4872	$5086	$5429	$5033	$4253
ANNUAL CHANGE	15%	−21%	−11%	2%	23%	19%	−4%	−6%	8%	18%	58%

a Planned. b Excludes Conoco. **Note:** Figures are for worldwide spending on construction, equipment, and land in consolidated businesses. Where possible, acquisition costs and investments in nonconsolidated businesses are excluded. **Source:** Company data

This year will bring another solid increase in chemical companies' R&D budgets . . .



. . . keeping outlays high relative to company sales volume



a R&D spending by basic chemical companies. b By basic chemical companies. c Estimates.
Sources: Worldwide data for 15 U.S. basic chemical companies, Battelle Columbus Laboratories, C&EN estimates

For the second year in a row, R&D spending by the U.S. chemical industry is rising only 8%, according to C&EN's survey of 15 chemical companies. That contrasts sharply with the double-digit budget increases that characterized the 1978–82 period, when spending jumped at a rate of nearly 15% per year.

Still, chemical industry spending on R&D has risen uninterruptedly over the past decade at an annual rate of 11%. Adjusted for the heady inflation of the past 10 years, on the other hand, the annual increase has been slightly under 4%. This year, factoring in expected inflation of industrial research costs, spending will climb just 3% above 1982's $2.8 billion, but that is a bit better than the 2% increase in outlays for R&D that 1982 registered over the year before.

At the same time, however, chemical industry spending continues to reflect a heightened emphasis on R&D. Research budgets may have been growing faster during the 1970s, but so were company revenues; R&D spending averaged just 2.9% of sales between 1974 and 1981. In 1982, that percentage jumped to 3.8%, thanks both to a 14% budget hike overall and a sharp cut in industry sales. The higher plateau has been maintained, however, and in 1984, the second year of recovery, R&D spending is forecast by C&EN to amount to nearly 4% of sales down only slightly from 1983's 4.0%.

CHEMICAL R&D SPENDING: Increases are more moderate than those of early 1980s

$ Millions	1984[a]	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
Air Products	$ 42	$ 40	$ 37	$ 32	$ 30	$ 24	$ 23	$ 24	$ 19	$ 16	$ 11
American Cyanamid	235	215	190	172	148	130	108	96	83	73	64
Celanese	100	88	102	104	94	92	83	77	70	64	58
Dow Chemical	508	492	460	404	314	269	232	203	188	167	149
Du Pont	945	875	775	647	591	509	461	367	353	336	344
Ethyl	39	39	39	37	34	29	25	28	25	19	25
W. R. Grace	82	71	62	55	45	42	37	32	28	30	32
Hercules	66	74	74	65	57	50	43	40	37	32	32
Lubrizol	38	37	36	33	28	23	21	19	17	17	15
Monsanto	385	290	264	233	208	161	136	132	114	116	87
Olin	55	51	47	39	31	26	25	25	23	24	19
PPG Industries	125	127	127	119	103	83	70	61	56	50	47
Rohm & Haas	100	100	92	77	67	54	49	45	43	45	39
Stauffer Chemical	66	63	57	49	44	35	32	32	28	23	20
Union Carbide	250	245	240	207	166	161	156	156	143	120	94
TOTAL	**$3036**	**$2807**	**$2602**	**$2273**	**$1960**	**$1688**	**$1501**	**$1337**	**$1227**	**$1132**	**$1036**
ANNUAL CHANGE	**8%**	**8%**	**14%**	**16%**	**16%**	**12%**	**12%**	**9%**	**8%**	**9%**	**21%**

a Planned. **Source:** Company data

The annual reports issued by U.S. chemical companies earlier this year, covering the results of their operations during 1983, certainly brought much more cheerful reading than those published a year earlier. A rapidly recovering U.S. economy bolstered demand for most chemical products—although agricultural chemicals were a notable exception—and, as a result of the recession-bred cost-cutting efforts of the past two or three years, a bigger share of each sales dollar could be carried through to profits.

Meanwhile, chemical companies were being tight-fisted with regard to spending for new plant and equipment, the biggest single outlet for their corporate funds. Demand for chemicals, even in a recovery year, was still far from enough to force producers to operate their manufacturing facilities full tilt and so encourage a burst of capital expenditures. As a result, the cash generated by higher profits was being put to other uses, such as increasing dividend payments or adding to working capital.

All this is evident from the data for 33 individual chemical companies and 16 pharmaceutical companies that are presented on this and the following four pages. Not all the companies covered participated in the overall recovery, of course. But even for some for whom last year's results look poorer than those of the previous year, the unfavorable comparison is more the result of corporate restructuring and the disposal of unwanted operations than a decline in the firm's continuing lines of business.

Explanation of table headings

Year. Data are for calendar year unless otherwise indicated.

Net sales. Gross sales, less discounts, allowances, and returns; generally excludes excise taxes and other operating income or revenues.

Net income. Net sales and other income, less operating costs, nonoperating charges, depreciation, depletion, interest expense, deferred charges, minority interest in income, and taxes. Nonrecurring or extraordinary credits and charges have been excluded in most cases, but these items are indicated by a footnote.

Total assets. Sum at year's end of current assets, investments, prepaid expenses, net plant and equipment, and other tangible assets. Excludes insofar as possible intangible assets including goodwill, value of patents and trademarks, and the like.

Current ratio. The ratio of current assets (cash, marketable securities, receivables, and inventories but excluding prepaid expenses) to total current liabilities.

Net plant and equipment. Value at year's end of fixed assets, less accumulated depreciation, amortization, and depletion.

Capital expenditures. Total spending during the year for new fixed assets, such as plant, equipment, and land, and for replacement and modernization of facilities.

Net worth. Equity at year's end of preferred and common stock holders, including value of capital stock, capital and earned surplus, and surplus reserves, as well as contingency and miscellaneous reserves for which no definite purpose is stated. Intangible assets are deducted insofar as possible.

Net income (breakdown). **Per cent of sales:** net income divided by net sales. **Per cent of net worth:** net income divided by tangible net worth. **Dollars per share:** net income, less preferred dividends, divided by the number of shares of common stock outstanding. All figures are adjusted for stock splits, but no adjustment has been made for earlier years as a result of stock dividends or for dilution that might result from the conversion of preferred stock or debt to common stock or the exercise of stock options outstanding.

Dividends per share. Cash dividends paid (or declared) on each share of common stock; excludes the value of stock dividends, which are indicated by a footnote.

Dividend yield. Dividends per share divided by the average of the high and low prices of the common stock during the calendar year.

Stock price range. High-low market prices of common stock during the calendar year, adjusted for stock splits but not for stock dividends.

Price-earnings ratio. Average of the high and low prices of the common stock during the calendar year divided by net income per share of common stock.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME: % of sales	NET INCOME: % of net worth	NET INCOME: $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price earnings ratio
	Money figures in thousands of dollars unless otherwise indicated													
CHEMICALS														
Air Products & Chemicals														
1983[a]	$1,634,246	$108,963	$2,160,157	1.1	$1,541,345	$246,417	$988,256	6.7%	11.0%	$3.55	$0.90	2.1%	$ 51–34	12.0
1982[a]	1,568,916	105,654[b]	2,118,882	1.2	1,497,162	346,680	867,565	6.7	12.2	3.68[b]	0.80	2.5	41 1/8–23 5/8	8.8
1981[a]	1,570,115	126,039	1,871,986	1.2	1,301,922	323,465	769,134	8.0	16.4	4.42	0.80	1.9	48 7/8–34	9.4
1980[a]	1,420,759	115,502	1,744,392	1.3	1,182,567	364,013	658,596	8.1	17.5	4.07	0.80	1.8	54 1/4–32 1/4	10.6
American Cyanamid Co.														
1983	$3,535,514	$166,356	$3,031,311	2.1	$1,255,658	$165,068	$1,378,875	4.7%	10.5%	$3.41	$1.75	3.8%	$ 59–33 5/8	13.6
1982	3,453,674	132,127	2,985,004	2.0	1,296,204	171,047	1,526,390	3.8	8.7	2.74	1.75	5.7	37 1/2–24 3/8	11.3
1981	3,649,073	197,054	3,049,917	1.9	1,325,063	180,597	1,513,457	5.4	13.0	4.11	1.675	5.5	36 1/2–24 1/2	7.4
1980	3,453,934	159,195	2,900,289	1.8	1,328,691	195,819	1,419,073	4.6	11.2	3.32	1.60	5.5	38–20 5/8	8.8
Baker Industries Corp.														
1983	$252,730	$ 1,001[c]	$326,818	1.1	$176,725	$ 9,687	$112,460	0.4%	0.9%	$0.08[c]	0.00	0.0	$121/4–5 1/2	110.9
1982	210,185	(5,256)[d]	304,073	0.8	178,796	18,534	102,015	—	—	(0.44)[d]	0.00	0.0	8 3/8–3 7/8	—
1981	206,813	1,254[e]	342,935	1.0	189,135	65,486	115,289	0.6	1.1	0.11[e]	0.00	0.0	25–7 1/2	147.7
1980	248,079	25,691[f]	286,821	1.3	133,850	32,150	119,748	10.4	21.5	2.21[f]	0.00	0.0	25–8 7/8	7.7
Betz Laboratories														
1983	$266,983	$33,100	$204,174	2.1	$110,872	$32,795	$161,766	12.4%	20.5%	$2.08	$0.94	2.4%	$44 3/4–32 1/4	18.5
1982	254,717	30,561	186,320	2.0	97,382	24,769	143,421	12.0	21.3	1.93	0.82	2.4	42 1/4–24 3/4	17.4
1981	252,545	28,815	165,650	2.7	71,914	16,526	126,799	11.4	22.7	1.83	0.68	2.5	33 1/4–21 3/4	15.0
1980	212,607	23,379	139,018	3.1	61,955	13,898	109,134	11.0	21.4	1.50	0.56	2.7	25 5/8–15 7/8	13.8

a Fiscal year ends Sept. 30. b Excludes extraordinary gain for debt-for-equity exchange of $2.8 million ($0.10 per share) and credit for cumulative effect of change in accounting principle for investment tax credit of $61.9 million ($2.16 per share). c Excludes extraordinary net gain on termination of pension plan of $1.8 million ($0.16 per share). d Net loss; excludes net loss from discontinued operations and their disposition of $8.0 million ($0.68 per share). e Excludes net loss from discontinued operations of $6.1 million ($0.52 per share). f Excludes net earnings from discontinued operations of $3.2 million ($0.28 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price earnings ratio
					Money figures in thousands of dollars unless otherwise indicated									
Big Three Industries														
1983	$668,841	$ 45,331	$1,097,602	3.0	$763,863	$ 71,581	$615,720	6.8%	7.4%	$1.07	$0.74	3.2%	$27¾-18½	21.6
1982	767,785	86,812	1,055,313	3.0	773,777	162,293	609,792	11.3	14.2	2.05	0.72	3.3	28½-15⅛	10.6
1981	823,280	108,854	1,015,259	2.7	680,709	158,234	555,765	13.2	19.6	2.57	0.60	1.9	37⅝-25	12.2
1980	659,121	86,604	815,048	2.2	583,772	142,542	472,607	13.1	18.3	2.05	0.47[a]	1.7	36⅛-18⅞	13.4
Cabot Corp.														
1983[b]	$1,558,016	$ 64,162	$1,293,340	2.6	$656,894	$ 76,964	$658,838	4.1%	9.7%	$2.00	$0.92	3.6%	$30⅞-20½	12.8
1982[b]	1,587,658	88,007	1,300,553	2.2	664,434	138,342	624,069	5.5	14.1	2.77	0.92	4.4	25½-16⅛	7.5
1981[b]	1,622,755	110,167	1,238,729	2.2	595,234	192,348	586,226	6.8	18.8	3.50	0.86	2.9	35½-23⅞	8.5
1980[b]	1,403,743	94,024[c]	1,138,683	2.0	456,507	117,705	497,546	6.7	18.9	3.00[c]	0.67	2.6	38⅜-14¾	8.5
Celanese Corp.														
1983	$3,261,000	$112,000	$2,869,000	1.7	$1,445,000	$105,000	$1,169,000	3.4%	9.6%	$6.89	$4.00	6.4%	$79¾-45	9.1
1982	3,062,000	(34,000)[d]	2,862,000	1.9	1,608,000	275,000	1,131,000	...	...	(2.45)[d]	4.00	7.9	59⅞-41¼	...
1981	3,752,000	144,000	2,991,000	2.0	1,518,000	414,000	1,233,000	3.8	11.7	9.01	3.85	6.4	69¼-51⅝	6.7
1980	3,348,000	122,000	2,633,000	2.0	1,197,000	253,000	1,101,000	3.6	11.1	8.20	3.50	6.8	62⅝-39⅞	6.2
Chemed Corp.														
1983	$271,343	$17,371[e]	$174,248	1.9	$35,012	$5,703	$ 58,420	6.4%	29.7%	$2.17[e]	$1.36	3.8%	$39⅜-32	16.4
1982	249,019	16,824[f]	152,735	1.7	30,887	5,008	36,448	6.8	46.2	1.79[f]	1.25	4.7	36-17⅜	14.9
1981	250,638	25,166[g]	216,915	2.7	29,583	5,481	168,542	10.0	14.9	1.26[g]	1.14	5.2	25-19	17.5
1980	219,019	18,973[h]	193,494	2.8	27,482	4,729	153,724	8.7	12.3	0.97[h]	1.04	6.0	19¾-14⅞	17.8
Crompton & Knowles Corp.														
1983	$230,560	$6,302	$125,388	2.7	$31,205	$2,954	$57,893	2.7%	10.9%	$1.81	$1.06	4.6%	$28⅞-16¾	12.6
1982	213,250	5,199	117,902	2.6	33,055	3,582	59,320	2.4	8.8	1.44	1.04	6.6	19⅝-12⅛	9.1
1981	243,412	8,571	132,197	2.3	32,668	6,699	63,606	3.5	13.5	2.51	0.95	6.1	18⅛-12⅞	6.2
1980	241,776	7,666	135,619	2.5	34,731	9,623	58,935	3.2	13.0	2.22	0.80	5.8	16⅝-10⅞	6.2
Dow Chemical Co.														
1983	$10,951,000	$293,000[i]	$11,785,000	1.4	$5,695,000	$ 630,000	$4,851,000	2.7%	6.0%	$1.50[i]	$1.80	5.7%	$38⅜-25	21.1
1982	10,618,000	342,000[j]	11,612,000	1.8	5,961,000	829,000	4,845,000	3.2	7.1	1.77[j]	1.80	7.4	28⅞-19⅝	13.7
1981	11,873,000	564,000	12,268,000	1.7	6,174,000	1,176,000	4,663,000	4.8	12.1	3.00	1.80	5.8	39-23⅜	10.4
1980	10,626,000	753,000[k]	11,429,000	1.5	5,672,000	1,184,000	4,331,000	7.1	17.4	4.14[k]	1.60	4.7	39¼-28¼	8.2
E. I. du Pont de Nemours & Co.														
1983	$35,378,000	$1,127,000	$24,432,000	1.7	$14,261,000	$2,628,000	$11,472,000	3.2%	9.8%	$4.70	$2.50	5.5%	$ 55-35½	9.6
1982	33,331,000	894,000	24,343,000	1.7	14,004,000	3,295,000	10,850,000	2.7	8.2	3.75	2.40	6.5	44⅜-30	9.9
1981	22,810,000	1,081,000[l]	23,829,000	2.0	12,722,000	2,389,000	10,458,000	4.7	10.3	5.81[l]	2.75	6.0	56-35¾	7.9
1980	13,652,000	716,000	9,560,000	2.3	4,414,000	1,279,000	5,690,000	5.2	12.6	4.83	2.75	6.8	49½-31⅛	8.3
Ethyl Corp.														
1983	$1,745,193	$106,038	$1,449,982	2.0	$626,461	$ 84,723	$811,260	6.1%	13.1%	$2.61	$0.85	3.9%	$29⅜-14½	8.4
1982	1,614,626	94,166	1,458,534	2.2	666,186	91,915	766,175	5.8	12.3	2.34	0.75	5.7	17⅛-9	5.6
1981	1,757,795	90,891	1,194,630	2.2	658,282	140,520	683,001	5.2	13.3	2.28	0.75	5.3	17¼-10⅞	6.2
1980	1,740,627	82,397[m]	1,138,233	2.4	602,029	156,388	631,831	4.7	13.0	2.05[m]	0.75	5.1	18¼-11⅛	7.1
Ferro Corp.														
1983	$619,179	$19,228	$364,861	1.9	$132,509	$20,252	$185,337	3.1%	10.4%	$3.04	$1.20	3.7%	$39⅞-24⅝	10.6
1982	595,830	10,277[n]	345,922	2.0	133,318	22,650	161,945	1.7	6.3	1.37[n]	1.20	4.9	30½-18½	17.9
1981	702,213	25,503	389,405	2.1	135,587	24,243	222,441	3.6	11.5	3.30	1.20	4.6	31½-20¾	7.9
1980	695,580	29,019	430,472	2.0	134,563	31,505	220,597	4.2	13.2	3.77	1.20	5.8	24¼-17	5.5
First Mississippi Corp.														
1983[o]	$203,976	$14,146	$379,436	1.3	$200,990	$47,428	$155,055	6.9%	9.1%	$0.69	$0.24	2.0%	$15½-8¼	17.2
1982[o]	222,977	23,212[p]	394,587	1.0	183,994	67,882	145,407	10.4	16.0	1.11[p]	0.24	2.2	16-6	9.9
1981[o]	357,697	29,704	318,926	1.5	117,244	58,277	138,384	8.3	21.5	1.38	0.23	1.2	26⅛-13⅛	14.2
1980[o]	242,690	21,154	236,579	2.1	83,525	37,202	113,672	8.7	18.6	0.98	0.18	0.9	30¾-7½	19.5
W. R. Grace & Co.														
1983	$6,219,500	$159,700[q]	$4,946,600	1.6	$2,715,400	$353,100	$2,094,300	2.6%	7.6%	$3.28[q]	$2.80	6.3%	$50⅜-38⅜	13.5
1982	6,127,600	319,500[r]	4,854,300	1.7	2,706,400	559,500	2,136,600	5.2	15.0	6.62[r]	2.70	7.2	48¼-28½	5.6
1981	6,520,800	361,300[s]	4,947,100	1.5	2,528,600	656,900	1,986,600	5.5	18.2	7.58[s]	2.45	5.0	59⅝-38½	6.5
1980	6,101,300	283,800[t]	4,281,500	1.5	2,162,700	657,400	1,713,100	4.7	16.6	6.08[t]	2.175	4.5	63½-32⅝	7.9
Great Lakes Chemical Corp.														
1983	$225,950	$23,842	$217,916	2.1	$121,411	$23,393	$132,286	10.6%	18.0%	$1.63	$0.30	1.1%	$39¾-16¾	17.3
1982	169,703	13,945[u]	192,127	2.2	113,659	19,143	111,782	8.2	12.5	0.96[u]	0.26	1.6	20⅛-12½	16.9
1981	150,333	18,031	170,198	1.9	98,580	22,777	108,878	12.0	16.6	1.25	0.22	0.9	29¼-18⅞	18.9
1980	126,705	18,948	118,407	3.2	61,747	20,496	93,258	15.0	20.3	1.33	0.18	0.8	25⅝-17⅞	16.3

a Plus 5% stock dividend. b Fiscal year ends Sept. 30. c From continuing operations; excludes net income from discontinued operations of $12.3 million ($0.39 per share) and net gain on sale of machinery division of $46.4 million ($1.49 per share). d Net loss; includes special charge related to 40% equity in Mexican affiliate of $39 million ($2.50 per share). e Excludes net gain on disposition of discontinued Dearborn Group operations of $875,000 ($0.11 per share). f Excludes net income from discontinued Dearborn Group operations of $1.9 million ($0.11 per share). g Excludes net income from discontinued Dearborn Group operations of $11.2 million ($0.56 per share). h Excludes net income from discontinued Dearborn Group operations of $9.7 million ($0.50 per share). i Includes pretax gain on sales of investments of $101 million but excludes extraordinary net gain on debt-for-equity exchange of $41 million ($0.21 per share). j Includes pretax gain on sales of investments of $214 million but excludes extraordinary net gain on debt-for-equity exchange of $57 million ($0.30 per share). k Excludes net gain on sale of Wanda Petroleum Co. of $52 million ($0.28 per share). l Excludes cumulative effects of change in accounting for investment tax credits of $320 million ($1.74 per share). m Excludes net gain on sale of property of $7.3 million ($0.19 per share). n Includes loss on divestitures of $1.9 million ($0.23 per share). o Fiscal year ends June 30. p From continuing operations; excludes net loss from discontinued FirstMiss subsidiary of $6.4 million ($0.30 per share). q Includes net gains on disposal of businesses of $5.7 million. r Includes gain on restructuring Chemed Corp. of $65.1 million and net losses on disposal of businesses of $600,000. s Includes net gains on disposal of businesses of $31.1 million. t Includes net gains on disposal of businesses of $10.3 million. u Excludes net gain on sale of real estate of $2.5 million ($0.34 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
	Money figures in thousands of dollars unless otherwise indicated													
Hercules														
1983	$2,628,954	$174,222	$2,175,173	2.1	$793,313	$167,993	$1,288,118	6.6%	13.5%	$3.17	$1.38	3.9%	$43 1/8–27 1/4	11.1
1982	2,468,971	86,861[a]	2,001,354	2.2	923,676	164,997	1,078,911	3.5	8.1	1.97[a]	1.32	5.8	28 3/4–16 7/8	11.6
1981	2,718,366	136,481	1,997,144	2.5	907,733	167,189	1,051,357	5.0	13.0	3.09	1.26	5.6	26 3/8–18 3/4	7.3
1980	2,485,226	114,000	1,889,679	2.0	872,656	229,163	1,009,746	4.6	11.3	2.60	1.20	6.0	25–15 1/8	7.7
Philip A. Hunt Chemical Corp.														
1983	$119,939	$5,351	$90,676	2.6	$32,954	$5,235	$58,953	4.5%	9.1%	$0.94	$0.50	2.8%	$20 1/2–15 3/4	19.3
1982	114,849	5,273	87,953	2.6	34,281	4,104	57,899	4.6	9.1	0.93	0.40	3.0	18–8 5/8	14.3
1981	111,871	3,816[b]	87,238	2.6	36,231	9,105	56,005	3.4	6.8	0.67[b]	0.40	3.9	12 1/8–8 1/2	15.4
1980	106,296	4,044[c]	78,020	3.0	32,376	6,930	56,788	3.8	7.1	0.71[c]	0.40	3.5	14 1/4–8 1/2	16.0
International Flavors & Fragrances														
1983	$460,945	$68,410	$458,262	3.5	$139,921	$26,851	$344,255	14.8%	19.9%	$1.87	$1.04	3.5%	$35 3/4–23 3/4	15.9
1982	447,889	63,160	431,589	4.1	135,565	28,369	335,902	14.1	18.8	1.73	1.01	4.3	30–17 3/8	13.7
1981	451,088	66,123	430,890	3.8	125,975	16,558	329,878	14.7	20.0	1.81	0.94	4.6	23–17 7/8	11.3
1980	448,309	63,232	414,859	3.8	121,228	17,461	315,485	14.1	20.0	1.73	0.86	3.9	27 1/2–16 5/8	12.8
International Minerals & Chemical Corp.														
1983[d]	$1,462,000	$ 80,500	$1,943,900	1.9	$1,983,700	$119,300	$1,024,100	5.5%	7.9%	$3.02	$2.60	6.5%	$ 49–31 3/8	13.3
1982[d]	1,560,400	122,300[e]	1,941,900	1.8	1,869,900	161,600	1,010,200	7.8	12.1	4.56[e]	2.60	8.6	36 7/8–23 1/2	6.6
1981[d]	1,984,900	153,800	1,975,200	1.7	1,896,300	336,600	975,300	7.7	15.8	5.63	2.46	5.1	66 1/2–30 3/8	8.6
1980[d]	1,789,600	145,900	1,848,600	2.0	1,062,900	262,100	881,300	8.2	16.6	5.38	2.16	4.5	66 1/2–30	9.0
Liquid Air Corp.														
1983	$459,409	$23,902	$500,573	1.5	$354,796	$41,620	$244,849	5.2%	9.8%	$1.80	$1.60	7.2%	$26 1/4–18 1/2	12.4
1982	448,996	27,512	503,090	1.8	353,376	58,657	247,801	6.1	11.1	2.13	1.60	9.1	20 3/4–14 3/4	8.3
1981	427,991	31,526[f]	465,128	1.6	285,026	61,818	239,776	7.4	13.1	2.86[f]	1.55	6.7	29 3/4–16 3/4	8.1
1980	408,249	27,448[g]	425,502	1.6	270,778	60,469	202,832	6.7	13.5	2.57[g]	1.40	5.2	34 1/2–19 3/4	10.6
Lubrizol Corp.														
1983	$789,546	$ 64,744[h]	$682,864	2.8	$274,337	$25,003	$471,521	8.2%	13.7%	$1.65	$1.08	4.7%	$27 7/8–18 1/8	13.9
1982	801,284	47,561	643,744	2.6	288,504	51,589	462,044	5.9	10.3	1.21	1.08	5.7	23 3/4–14 1/4	15.7
1981	878,291	92,031	673,165	2.6	284,088	75,399	478,518	10.5	19.2	2.36	1.08	3.9	35 1/2–20 3/8	11.8
1980	902,312	111,511	651,137	2.5	248,664	92,140	452,787	12.4	24.6	2.87	0.90	2.7	41 3/4–24 7/8	11.6
Monsanto Co.														
1983	$6,299,000	$369,000[i]	$6,427,000	2.1	$3,284,000	$560,000	$3,667,000	5.9%	10.1%	$ 8.97[i]	$4.15	4.4%	$116 3/8–74 1/4	10.6
1982	6,325,000	329,000[i]	6,077,000	2.4	3,313,000	673,000	3,490,000	5.2	9.4	8.21[i]	3.95	5.4	89–56 5/8	8.9
1981	6,947,700	445,100[k]	6,069,200	2.2	3,183,900	667,900	3,330,200	6.4	13.4	11.50[k]	3.75	5.1	87 1/2–59 1/2	6.4
1980	6,573,600	148,800[l]	5,796,400	1.9	3,109,100	780,500	2,808,200	2.3	5.3	4.10[l]	3.55	6.3	70 1/4–42 1/4	13.7
Nalco Chemical Co.														
1983	$659,403	$71,000	$489,095	2.3	$191,791	$40,505	$350,471	10.8%	20.3%	$1.78	$1.14	3.5%	$ 37–28	18.3
1982	643,863	64,356[m]	464,868	2.2	194,450	56,241	336,488	10.0	19.1	1.62[m]	1.12	4.3	34–18	16.0
1981	666,591	81,209	466,175	2.2	176,959	59,423	335,974	12.2	24.2	2.02	1.00	4.0	29 1/8–20 1/2	12.3
1980	616,709	72,261	416,233	2.7	138,137	34,923	306,550	11.7	23.6	1.80	0.80	3.9	26 5/8–14	11.2
Olin Corp.														
1983	$1,934,579	$71,715	$1,829,416	1.9	$850,936	$122,580	$848,355	3.7%	8.5%	$3.01	$1.23	4.3%	$ 34–23	9.5
1982	1,823,137	62,800[n]	1,636,027	1.7	839,974	139,015	805,185	3.4	7.8	2.66[n]	1.20	5.7	26 1/4–15 1/2	7.8
1981	2,001,346	92,836	1,618,034	1.6	844,927	186,331	793,187	4.6	11.7	3.88	1.15	4.9	27–19 1/2	6.0
1980	1,852,853	73,931[o]	1,550,128	1.7	822,412	172,016	750,120	4.0	9.9	3.08[o]	1.025	5.8	23 1/8–12 1/2	5.8
Pennwalt Corp.														
1983	$ 976,741	$44,796[p]	$851,982	2.6	$348,190	$69,808	$458,077	4.6%	9.8%	$3.58[p]	$2.20	5.9%	$45 3/4–29	10.4
1982	952,400	24,502[q]	737,048	1.6	342,785	76,466	346,364	2.6	7.1	2.37[q]	2.20	7.8	34 7/8–21 1/2	11.9
1981	1,056,118	36,661[r]	755,755	2.1	309,525	52,696	367,098	3.5	10.0	3.55[r]	2.20	7.1	36–26 1/4	8.8
1980	1,188,702	43,291	810,761	2.0	314,315	55,546	373,363	3.6	11.3	4.20	2.20	7.4	30 3/8–25 3/8	7.1
Reichhold Chemicals														
1983	$747,263	$21,700	$382,273	2.0	$175,722	$19,305	$211,081	2.9%	10.3%	$2.74	$0.51	1.8%	$38 7/8–18 1/4	10.4
1982	814,911	6,875[s]	364,133	2.5	159,181	20,516	200,546	0.8	3.4	0.57[s]	0.48	3.2	19 5/8–10	26.0
1981	950,112	17,054[t]	405,477	2.3	173,398	15,908	206,727	1.8	8.2	2.04[t]	0.48	3.5	16–11 1/8	6.5
1980	885,059	16,114	424,760	2.1	179,550	22,656	203,941	1.8	7.9	1.90	0.61	5.0	15–9 5/8	6.5
Rohm & Haas Co.														
1983	$1,875,937	$137,603	$1,511,244	2.7	$518,360	$ 71,534	$904,393	7.3%	15.2%	$5.33	$1.50	2.5%	$ 81–37 3/4	11.3
1982	1,828,027	85,605[u]	1,365,163	2.5	546,623	125,927	807,853	4.7	10.6	3.32[u]	1.40	4.5	39 1/2–22 3/4	9.4
1981	1,884,664	93,085[v]	1,348,627	2.4	537,489	181,635	759,911	4.9	12.2	3.61[v]	1.28	4.3	35 7/8–23 3/8	8.2
1980	1,725,304	93,744	1,240,456	2.6	488,185	93,013	703,124	5.4	13.3	3.63	1.08	4.9	27 5/8–16 3/8	6.3

a Excludes extraordinary net gain on debt-for-equity exchange of $11.6 million ($0.25 per share). b From continuing operations; excludes net loss on disposal of photofinishing business of $146,000 ($0.03 per share). c From continuing operations; excludes net loss on operations and disposal of photofinishing business of $1.9 million ($0.33 per share). d Fiscal year ends June 30. e From continuing operations; excludes earnings and net gain on disposal of discontinued chemical operations of $15.1 million ($0.57 per share). f Includes net gain on sale of assets, before taxes, of $1.0 million. g Excludes net gain on sale of assets of $2.0 million ($0.19 per share). h Includes net gain on sale of investments of $7.5 million ($0.19 per share). i Excludes extraordinary net tax benefits from utilization of ex-U.S. loss carry-forwards of $33 million ($0.81 per share). j Excludes extraordinary net gain on debt-for-equity exchange of $23 million ($0.58 per share) but includes net loss on sale of European acrylic fibers business of $18 million ($0.46 per share). k Includes net gain on sale of joint venture of $67.7 million ($1.75 per share). l Includes net loss on withdrawal from polyester filament business in the U.S. of $69.0 million ($1.90 per share) and from termination of Aiscondel of $38.7 million ($1.07 per share). m Excludes net loss on discontinued Industrial Bio-Test Laboratories operations of $6.2 million ($0.16 per share). n Excludes special charge for DDT claims, net, of $9.5 million ($0.40 per share). o Excludes net charge for restructuring of Winchester group of $40.0 million ($1.07 per share). p Includes gain on sale, retirement, and revaluation of assets, before taxes, of $21.7 million. q From continuing operations; excludes provision for loss on disposal of discontinued operations of $2.8 million ($0.27 per share). r From continuing operations; includes cost of shutdown of chlorine-caustic plant, before taxes, of $21.5 million but excludes net loss on operations and disposal of discontinued businesses of $11.4 million ($1.10 per share) and nonrecurring net gain from cumulative effect of change in accounting for investment credit of $16.3 million ($1.57 per share). s Excludes net loss resulting from asset redeployment/divestiture program of $2.2 million ($0.32 per share). t Excludes extraordinary net charge for settlement of litigation of $2.4 million ($0.34 per share). u Includes net gain on shutdown and disposal of assets of $10.4 million ($0.40 per share). v Includes net loss from shutdown and disposal of assets of $6.6 million ($0.25 per share).

2 Finances of the U.S. Chemical Industry

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
	Money figures in thousands of dollars unless otherwise indicated													
Stauffer Chemical Co.														
1983[a]	$1,339,947	($12,348)[b]	$2,032,495	2.2	$1,128,752	$103,627	$1,009,297	...	...	($0.28)[b]	$1.44	5.3%	$31¾–22⅛	...
1982	1,618,235	123,547	2,170,162	2.5	1,200,576	176,872	1,065,751	7.6%	11.6%	2.81	1.41	6.2	28⅜–17	8.1
1981	1,726,236	150,093[c]	2,013,863	2.4	1,170,253	238,555	1,009,034	8.7	14.9	3.41[c]	1.29	5.5	27¾–18¾	6.8
1980	1,695,219	121,743[d]	2,084,441	1.4	1,072,896	246,454	909,490	7.2	13.4	2.77[d]	1.175	6.0	24⅜–14½	7.0
Stepan Chemical Co.														
1983	$207,074	$6,337	$144,997	1.5	$76,044	$ 9,804	$58,450	3.1%	10.8%	$1.75	$0.58	3.9%	$17½–12	8.4
1982	208,373	5,303	163,326	1.3	75,475	16,148	55,067	2.5	9.6	1.45	0.56	4.1	18⅛–9¼	9.4
1981	204,522	6,545[e]	176,068	1.5	67,906	12,083	53,888	3.2	12.1	1.74	0.515	3.0	21⅞–12⅝	9.8
1980	157,517	3,683[f]	137,688	1.5	64,338	9,204	50,498	2.3	7.3	0.98[f]	0.47	4.5	12¼–8½	10.5
Union Carbide Corp.														
1983	$ 9,001,000	$218,000[g]	$10,226,000	1.8	$6,282,000	$ 761,000	$4,860,000	2.4%	4.5%	$ 3.11[g]	$3.40	5.4%	$73⅞–51	20.1
1982	9,061,000	310,000	10,552,000	1.9	6,356,000	1,179,000	5,095,000	3.4	6.1	4.47	3.40	6.7	61–40⅛	11.3
1981	10,168,000	649,000	10,366,000	2.1	5,794,000	1,186,000	5,206,000	6.4	12.5	9.56	3.30	6.1	62⅛–45¼	5.6
1980	9,994,000	673,000[h]	9,600,000	2.1	5,207,000	1,129,000	4,717,000	6.7	14.3	10.08[h]	3.10	7.1	52½–35¼	4.4
Williams Cos.														
1983	$2,167,000	$ 54,000	$4,686,400	0.7	$3,193,000	$253,400	$1,173,900	2.5%	4.6%	$1.79	$1.20	5.1%	$30⅛–16¾	13.1
1982	1,691,315	29,682[i]	2,369,791	1.7	1,513,712	171,895	1,029,411	1.8	2.9	1.00[i]	1.20	5.6	29⅜–13⅛	21.2
1981	1,976,336	99,167[j]	2,445,877	1.6	1,497,797	233,184	1,027,245	5.0	9.7	3.32[j]	1.20	3.4	46⅝–23½	10.6
1980	2,072,686	138,696	2,380,001	1.8	1,417,799	339,625	965,715	6.7	14.4	5.07	1.10	2.9	49⅜–26¾	7.5
Witco Chemical Corp.														
1983	$1,385,744	$52,022	$715,472	2.1	$313,794	$44,901	$319,334	3.8%	16.3%	$3.60	$1.26	4.6%	$37¼–17⅜	7.6
1982	1,305,418	29,842	643,911	2.2	291,914	54,130	281,013	2.3	10.6	2.10	1.20	7.2	19⅝–13¾	8.0
1981	1,291,878	38,580	707,181	1.7	281,945	55,479	277,973	3.0	13.9	2.76	1.10	6.1	21–15⅛	6.6
1980	1,175,695	40,954	612,882	2.1	238,761	45,663	248,315	3.5	16.5	3.00	1.00	5.6	22½–13½	6.0
PHARMACEUTICALS														
Abbott Laboratories														
1983	$2,927,873	$347,617	$2,824,128	1.7	$1,069,200	$311,800	$1,417,883	11.9%	24.5%	$2.86	$1.00	2.2%	$55⅜–36⅛	15.6
1982	2,602,447	289,123	2,566,909	1.1	901,059	266,600	1,310,886	11.1	22.1	2.37	0.84	2.5	41¼–25⅜	14.1
1981	2,342,524	247,283	2,355,613	1.1	729,402	212,400	1,152,050	10.6	21.5	2.01	0.72	2.6	32¼–23⅝	13.9
1980	2,038,155	214,413	2,062,835	1.2	583,214	162,548	1,027,222	10.5	20.9	1.73	0.60	2.6	28½–17	13.2
American Home Products Corp.														
1983	$4,856,501	$627,233	$2,864,104	2.9	$812,370	$204,680	$1,826,964	12.9%	34.3%	$4.00	$2.40	5.0%	$54¼–41¾	12.0
1982	4,582,096	560,103	2,602,346	2.6	725,352	153,812	1,614,192	12.2	34.7	3.59	2.15	5.3	48–33¼	11.3
1981	4,131,237	497,332	2,517,541	3.0	692,879	99,852	1,583,475	12.0	31.4	3.18	1.90	5.8	37¼–28⅛	10.3
1980	3,798,524	445,889	2,289,460	2.8	450,490	99,393	1,391,972	11.7	32.0	2.84	1.70	6.4	31⅞–21⅜	9.4
Baxter Travenol Laboratories														
1983	$1,842,544	$218,055	$2,127,037	1.6	$746,304	$192,464	$1,151,109	11.8%	18.9%	$1.54	$0.28	1.1%	$31¼–20	16.6
1982	1,671,445	186,885	1,792,710	1.9	628,720	148,812	1,061,009	11.2	17.6	1.32	0.23	1.1	25½–15⅛	15.4
1981	1,503,890	150,581	1,590,743	2.6	583,084	87,101	978,325	10.0	15.4	1.07	0.19	1.3	16⅞–12	13.4
1980	1,374,384	128,400	1,412,638	2.8	560,690	118,645	852,506	9.3	15.1	0.93	0.16	1.4	14⅛–8⅞	12.4
Bristol-Myers Co.														
1983	$3,917,000	$408,000	$2,888,300	2.2	$701,700	$165,000	$1,788,900	10.4%	22.8%	$3.00	$1.16	2.9%	$47⅞–31¼	13.2
1982	3,599,900	348,700	2,665,800	2.2	653,600	170,000	1,624,000	9.7	21.5	2.59	1.02	3.3	37–25⅜	12.0
1981	3,496,700	305,800	2,406,000	2.2	581,800	159,300	1,482,000	8.7	20.6	2.29	0.89	3.4	29⅝–22⅞	11.4
1980	3,158,300	270,600	2,125,500	2.3	484,900	131,600	1,296,200	8.6	20.9	2.04	0.78	3.8	26–15¼	10.1
Eli Lilly & Co.														
1983	$3,033,700	$457,400	$3,413,800	1.7	$1,212,600	$199,900	$2,121,000	15.1%	21.6%	$6.13	$2.75	4.4%	$68⅜–56½	10.2
1982	2,962,711	411,828	3,155,125	1.8	1,135,575	236,642	2,055,460	13.9	20.0	5.42	2.60	4.7	65¼–45⅛	10.2
1981	2,773,205	374,478	2,902,262	1.9	1,006,180	253,735	1,888,260	13.5	19.8	4.93	2.375	4.2	68¾–45¼	11.6
1980	2,558,637	341,974	2,607,452	2.0	849,034	230,700	1,736,693	13.4	19.7	4.52	2.20	4.0	65½–45¾	12.3

a Fiscal year ends Sept. 30 (1983 only). b Net loss; excludes extraordinary net gains on refinancing of $10.6 million ($0.24 per share). c Excludes net loss on facility disposal and asset write-down of $169,000. d Excludes net gain on disposal of facilities of $14.8 million ($0.34 per share). e Includes loss on sale of flavor compounding business, before taxes, of $890,000. f Excludes net gain on sale of Polychem department of $1.7 million ($0.93 per share). g Excludes nonrecurring net charge for closing of facilities of $139 million ($1.98 per share). h Excludes cumulative effect of change in accounting principle for investment tax credit of $217 million ($3.28 per share). i From continuing operations; excludes net income from discontinued operations of $4.7 million ($0.15 per share). j From continuing operations; excludes net income from discontinued operations of $10.4 million ($0.35 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
	Money figures in thousands of dollars unless otherwise indicated													
Merck & Co.														
1983	$3,246,139	$450,855	$4,214,698	1.7	$1,715,207	$272,756	$2,434,613	13.9%	18.5%	$6.10	$2.80	3.0%	$104⅝–81¾	15.3
1982	3,063,017	415,137	3,647,652	1.9	1,557,490	295,106	2,203,988	13.6	18.8	5.61	2.80	3.7	88¼–64	13.6
1981	2,929,455	398,265	3,310,000	1.7	1,395,567	322,814	2,001,460	13.6	19.9	5.36	2.60	2.9	103–76¼	16.7
1980	2,734,012	415,396	2,865,755	2.3	1,185,244	256,488	1,863,322	15.2	22.3	5.54	2.30	3.2	86–58¼	13.0
Pfizer														
1983	$3,750,000	$447,100	$3,830,000	2.0	$1,157,000	$214,900	$2,074,700	11.9%	21.6%	$2.73	$1.16	3.0%	$44¾–33⅝	14.4
1982	3,453,600	332,800	3,644,500	1.9	1,124,700	265,500	1,869,500	9.6	17.8	2.13	0.92	2.8	40⅜–25	15.3
1981	3,249,700	273,700[a]	3,544,200	1.9	998,200	287,100	1,594,700	8.4	17.2	1.82[a]	0.80	3.4	27½–20	13.1
1980	3,029,300	254,800	3,247,300	1.9	825,000	163,600	1,456,500	8.4	17.5	1.74	0.72	3.4	26⅞–16	12.3
Richardson-Vicks														
1983	$1,115,700	$51,400	$755,000	1.8	$241,600	$34,000	$264,900	4.6%	19.4%	$2.10	$1.48	5.6%	$29⅞–23⅜	12.7
1982[b]	1,115,600	66,900	687,100	2.0	247,000	57,500	394,600	6.0	17.0	2.74	1.48	5.6	32½–20½	9.7
1981[b]	1,088,100	83,200[c]	672,200	1.7	208,600	49,300	365,300	7.6	22.8	3.47[c]	1.32	4.7	34¾–21¾	8.1
1980[b,d]	1,211,651	84,209	829,551	2.0	242,568	52,630	427,938	6.9	19.7	3.56	1.20	4.3	38⅛–17½	7.8
A. H. Robins Co.														
1983	$563,510	$58,221[e]	$459,462	3.1	$107,651	$20,955	$305,636	10.3%	19.0%	$2.40	$0.62	2.7%	$29⅜–16	9.5
1982	482,324	48,693[f]	386,843	3.8	98,079	15,815	267,945	10.1	18.2	1.98[f]	0.52	3.3	20⅛–11¼	7.9
1981	450,854	44,228[g]	385,483	3.0	96,457	28,103	251,742	9.8	17.6	1.77[g]	0.44	3.8	14¾–8½	6.6
1980	432,328	25,470[h]	337,318	2.9	80,511	30,273	227,142	5.9	11.2	1.01[h]	0.42	4.4	12½–6⅝	9.5
Schering-Plough Corp.														
1983	$1,808,500	$178,500[i]	$2,309,800	1.3	$841,400	$177,700	$1,186,500	9.9%	15.0%	$3.40[i]	$1.68	4.0%	$48⅛–36¾	12.5
1982	1,817,900	183,500	2,341,200	1.8	747,500	180,400	1,278,500	10.1	14.4	3.39	1.68	4.8	43¾–26¼	10.3
1981	1,808,800	179,300	2,214,500	1.9	654,600	170,300	1,254,200	9.9	14.3	3.31	1.60	4.9	42½–24⅞	10.2
1980	1,740,400	239,300	1,925,800	1.7	524,800	130,900	1,193,800	13.7	20.0	4.45	1.56	4.2	45⅝–29⅛	8.4
G. D. Searle & Co.														
1983	$ 946,000	$119,000[j]	$1,278,100	2.3	$361,900	$124,800	$668,100	12.6%	17.8%	$2.39[j]	$0.52	1.1%	$55⅞–34¾	19.0
1982	1,036,900	140,400	1,204,500	2.1	377,800	135,200	599,700	13.5	23.4	2.77	0.52	1.4	45¼–28⅝	13.3
1981	942,300	130,900[k]	1,050,400	2.3	279,300	87,600	533,600	13.9	24.5	2.52[k]	0.52	1.7	35½–25⅛	12.0
1980	1,081,558	94,341[l]	1,089,920	1.4	249,695	66,961	508,844	8.7	18.5	1.78[l]	0.52	2.3	27⅝–17¼	12.6
SmithKline Beckman Corp.														
1983	$2,835,391	$485,990[m]	$3,085,409	1.8	$988,857	$232,914	$1,970,793	17.1%	24.7%	$5.85[m]	$2.65	4.0%	$76½–55¼	11.3
1982	2,968,667	455,157	2,765,900	2.1	971,302	304,784	1,749,407	15.3	26.0	5.51	2.39	3.5	77⅝–57⅜	12.3
1981	1,985,341	370,000	1,796,105	2.3	580,920	200,816	1,138,457	18.6	32.5	5.55	2.12	2.8	88⅜–63⅞	13.7
1980	1,771,938	307,994	1,490,914	2.4	421,788	132,806	923,723	17.4	33.3	4.65	1.725	2.8	80⅝–43½	13.3
Squibb Corp.														
1983	$1,768,891	$173,274[n]	$1,887,783	2.2	$564,613	$109,800	$1,173,399	9.8%	14.8%	$3.31[n]	$1.365	2.8%	$55⅝–42⅞	14.9
1982	1,660,766	153,636	1,871,882	2.1	511,821	87,280	1,037,989	9.3	14.8	3.01	1.28	3.2	50⅞–29	13.2
1981	1,523,911	41,098[o]	1,900,424	2.1	479,720	69,851	979,689	2.7	4.2	0.83[o]	1.215	3.8	37⅝–26⅝	38.7
1980	1,675,780	123,079[p]	1,858,270	2.3	600,895	89,032	964,504	7.3	12.8	2.56[p]	1.155	3.6	39¼–24⅜	12.4
Sterling Drug														
1983	$1,901,171	$136,844	$1,437,440	2.5	$366,328	$63,189	$879,655	7.2%	15.6%	$2.24	$1.11	4.3%	$29⅝–22⅛	11.6
1982	1,796,153	131,970	1,297,989	2.6	356,535	80,068	825,944	7.3	16.0	2.17	1.06	4.3	29⅝–19¾	11.4
1981	1,792,925	130,303	1,226,41[illegible]	2.5	334,980	77,016	787,542	7.3	16.5	2.15	0.98	4.3	26⅛–19	10.5
1980	1,701,433	123,337	1,214,2[illegible]	2.4	318,109	70,051	752,640	7.2	16.4	2.04	0.90	4.2	26⅞–16	10.5
Upjohn Co.														
1983	$1,986,106	$160,225	$2,195,048	1.9	$754,954	$155,016	$1,057,288	8.1%	15.2%	$5.28	$2.35	4.1%	$68¾–46¼	10.9
1982	1,828,730	126,020	2,013,985	1.9	675,869	137,273	973,028	6.9	13.0	4.18	2.28	4.7	59⅜–38	11.6
1981	1,898,334	181,764	1,940,485	2.0	614,481	139,211	965,267	9.6	18.8	6.04	2.07	3.6	69–45⅝	9.5
1980	1,760,576	170,375	1,669,621	1.9	544,322	109,800	865,753	9.7	19.7	5.71	1.93	3.5	68–41½	9.6
Warner-Lambert Co.														
1983	$3,108,325	$200,496	$2,368,879	1.7	$826,232	$165,854	$ 869,980	6.5%	23.0%	$2.51	$1.42	4.7%	$ 35–25¾	12.1
1982	3,245,967	174,970[q]	2,344,259	1.9	768,571	153,507	815,864	5.4	21.4	2.20[q]	1.40	5.6	30⅛–19⅝	11.3
1981	3,379,952	9,222[r]	2,662,418	1.7	869,753	165,833	1,084,796	0.3	0.9	0.12[r]	1.34	6.4	25–17⅛	175.5
1980	3,479,207	192,716[s]	2,638,077	2.1	827,131	138,688	1,171,477	5.5	16.5	2.41[s]	1.32	6.6	23¼–17	8.4

a From continuing operations; excludes net loss from discontinued diagnostic imaging operations and provision for loss on disposal of discontinued operations of $52.4 million ($0.34 per share). b Fiscal year ends June 30. c From continuing operations; excludes net loss from discontinued ethical pharmaceutical businesses of $3.9 million ($0.16 per share). d Data for Richardson-Merrell prior to sale (in March 1981) of ethical pharmaceutical businesses to Dow Chemical Co. e Includes income, before taxes, from litigation settlement of $2.3 million. f Includes income, before taxes, from litigation settlement of $3.1 million. g Includes income, before taxes, from litigation settlement of $3.4 million. h Includes income, before taxes, from litigation settlement of $3.6 million and provision for net losses on disposition of businesses of $4.7 million ($0.19 per share). i From continuing operations; excludes net gain on sale of discontinued home products business of $11.6 million ($0.22 per share). j From continuing operations; excludes gain on sale of Pearl Health Services shares of $39.0 million but excludes net income and gain on sale of discontinued specialty gas and Australian specialty chemical operations of $32.2 million ($0.65 per share). k From continuing operations; excludes net loss from operations and disposition of discontinued businesses of $26.0 million ($0.50 per share) and debit for cumulative effect of changes in accounting principles of $6.2 million ($0.12 per share). l From continuing operations; excludes reserve for loss on sale of assets of diagnostic business of $9.0 million ($0.17 per share) and extraordinary tax credit of $13.0 million ($0.24 per share). m From continuing operations; excludes net income of discontinued Industrial Business Group of $3.5 million ($0.04 per share). n Excludes extraordinary net gain on early extinguishment of debt of $27.0 million ($0.52 per share) and net loss on disposal of Latin American operations of $27.6 million ($0.53 per share). o From continuing operations; excludes net gain on sale of confectionery products business of $58.1 million ($1.16 per share), net income from that business of $12.2 million ($0.24 per share), and extraordinary charge relating to takeover of operations in Iran of $6.5 million ($0.13 per share). p From continuing operations; excludes net income of divested food services and related operations of $4.3 million ($0.09 per share). q Includes nonrecurring net credit of $12 million ($0.15 per share). r Includes nonrecurring net charge of $134 million ($1.68 per share). s Includes nonrecurring net charge of $3 million ($0.03 per share).

Productivity up as capacity use improves

Many measures of chemical productivity took a postrecession turn in 1983, improving over the year before. An increase in output, coupled with lower employment, had a lot to do with it. But also, companies are working to increase efficiency, which is starting to pay off.

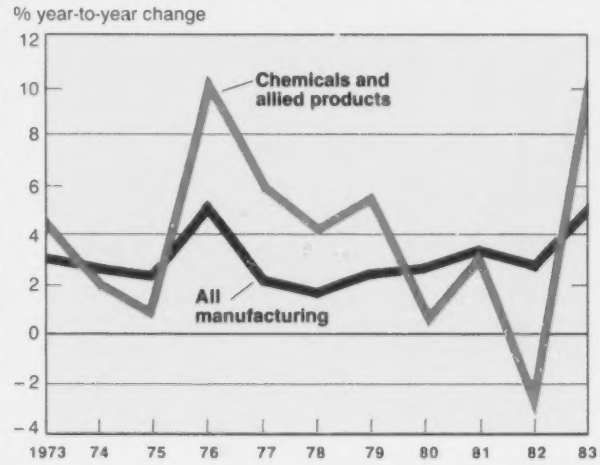
The result is that productivity for chemicals and allied products increased more than twice as fast as it did for all manufacturing. And labor costs also declined much faster for chemicals than for manufacturing as a whole.

Production of chemicals climbed 10% in 1983, whereas for all manufacturing it rose 8%. At the same time, total workhours per week fell 0.5% for chemicals while they were rising 2.3% for all manufacturing. However, wages for production personnel rose a more rapid 6% in the chemical industry but only 4% for all manufacturing.

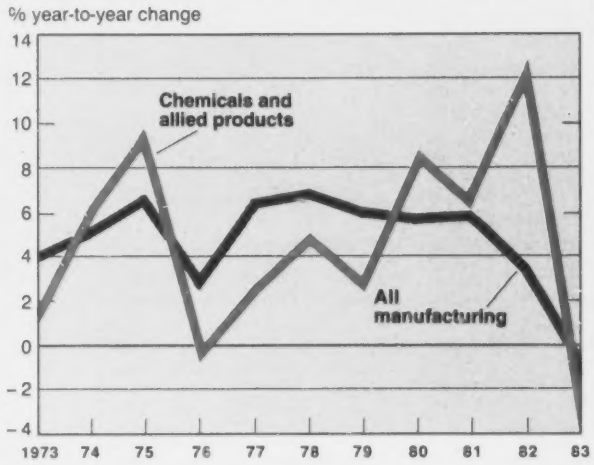
Thus, productivity (output per workhour) increased nearly 11% for chemicals and allied products, more than double the increase of 5% for all manufacturing. This follows a decline of 3.2% in 1982 for chemicals and a rise of 2.6% for manufacturing. Unit labor costs fell 4% last year for chemicals but only 1% for all manufacturing. The year before, unit labor costs for chemicals rose 13%.

Chemical capacity use also began to rebound in 1983. The latest C&EN survey for basic chemicals shows plants operating at 72% of capacity in early 1984 as opposed to 64% the year before.

A surge in labor productivity last year . . .



. . . brought unusual cut in unit labor costs



Note: Productivity is output per workhour, calculated by dividing indexes for production by indexes for workhours of production employees. Unit labor costs are labor costs per unit of output, calculated by dividing indexes for wages by indexes for output per workhour. **Sources:** Department of Labor, Federal Reserve Board, C&EN estimates

PRODUCTIVITY: A big increase for chemical companies in 1983 after 1982's slump

Indexes, 1967 = 100	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
CHEMICALS & ALLIED PRODUCTS											
Production	215.8	196.1	215.6	206.6	210.4	197.4	185.7	170.9	147.2	159.4	154.4
Workhours	99.1	99.6	105.9	105.1	107.4	106.5	104.2	101.4	96.5	105.1	103.7
Productivity	217.8	196.9	203.5	196.6	195.9	185.4	178.3	168.6	152.6	151.7	149.0
Hourly production wages	341.6	321.3	294.2	267.7	245.2	226.5	207.4	190.6	173.9	157.4	145.5
Unit labor costs	156.8	163.2	144.6	136.2	125.1	122.1	116.3	113.1	113.9	103.8	97.6
ALL MANUFACTURING											
Production	148.3	137.6	150.4	146.6	153.2	146.8	138.4	130.3	116.3	129.4	129.8
Workhours	87.6	85.6	96.0	97.0	104.1	102.5	98.0	94.2	88.6	100.9	104.0
Productivity	169.2	160.8	156.7	151.2	147.1	143.3	141.2	138.3	131.2	128.2	124.8
Hourly production wages	313.5	301.4	283.3	257.8	237.6	218.8	201.4	185.1	171.3	156.7	145.0
Unit labor costs	185.3	187.5	180.8	170.5	161.5	152.7	142.7	133.9	130.5	122.3	116.3

Sources: Department of Labor, Federal Reserve Board, C&EN calculations

OPERATING RATES: Capacity use is rising but early this year remained below 1981 levels

Billions of lb per year unless otherwise noted[a]	1ST-QTR 1984		3RD-QTR 1983		1ST-QTR 1983		3RD-QTR 1982		1ST-QTR 1982		3RD-QTR 1981	
	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use
ORGANIC CHEMICALS												
Benzene (bg)	2.4	51%	2.3	60%	2.3	43%	2.4	48%	2.4	44%	2.7	67%
Butadiene[c]	4.5	51	4.5	58	4.5	37	4.4	40	4.6	42	4.6	67
Cyclohexane	3.4	62	3.4	52	3.4	31	3.1	37	3.1	33	3.4	59
DMT-TPA[d]	7.6	82	7.6	80	7.3	64	7.3	56	7.3	58	7.3	71
Ethylene	36.5	82	38.4	74	39.0	67	39.0	61	39.7	56	41.0	65
Formaldehyde, 37% solution	9.2	56	9.2	56	9.2	55	8.9	47	8.9	51	8.9	65
Methanol (bg)	1.9	60	1.8	63	1.7	56	1.6	76	1.5	72	1.4	83
Phenol	3.3	85	3.3	83	3.6	64	3.6	61	4.0	56	4.0	67
Propylene, chemical	23.0	59	23.0	61	23.0	49	23.0	56	23.0	44	23.5	59
Styrene	7.8	92	8.1	77	8.2	64	8.7	69	8.7	79	8.9	74
Urea (mt)	7.8	83	7.8	59	7.8	73	7.8	72	7.8	65	8.0	90
Vinyl acetate	2.4	87	2.4	83	2.4	90	2.3	91	2.4	72	2.4	79
Vinyl chloride	10.0	54	9.3	79	10.1	65	10.0	68	9.6	50	9.7	70
***p*-Xylene**	4.9	85	4.9	93	4.9	68	4.9	60	5.5	54	5.6	64
INORGANIC CHEMICALS												
Ammonia (mt)	17.8	88	18.7	64	18.7	71	19.8	82	19.8	84	24.0	80
Carbon black	3.3	86	3.3	73	3.3	63	3.4	62	3.4	75	3.4	82
Carbon dioxide (ttd)[e]	19.0	67	19.6	64	18.9	61	18.4	67	17.7	63	16.4	71
Caustic soda (mt)	14.3	68	15.5	66	15.4	66	15.6	61	15.7	59	15.5	75
Chlorine (mt)	13.4	72	14.5	70	14.4	66	14.6	64	14.8	62	14.8	78
Nitrogen, **Oxygen** } total, liquid (ttd)	39.4	61	40.0	64	37.0	64	36.6	65	37.6	64	36.0	66
Phosphoric acid, (P_2O_5) (mt)[f]	12.5	82	12.5	66	12.5	71	12.6	64	12.4	62	11.5	91
Phosphorus (mt)	0.55	67	0.55	67	0.55	82	0.55	68	0.55	66	0.55	78
Soda ash (mt)	11.0	77	10.7	81	10.7	74	10.9	73	10.4	76	10.0	83
Sulfuric acid (mt)	58.0	66	57.5	52	57.5	59	59.6	49	59.4	54	58.5	74
Titanium dioxide (mt)	0.90	84	0.91	86	1.0	60	1.0	61	1.0	53	1.0	82
AVERAGE		72%		69%		63%		62%		60%		74%

a bg = billions of gallons, mt = millions of tons, ttd = thousands of tons per day. b Nameplate capacity. c Total extraction capacity, which runs about 25% more than basic production capacity. d Dimethyl terephthalate-purified terephthalic acid, not including acid converted to dimethyl terephthalate. e Excludes oil field operations. f Includes both wet-process and furnace-process capacity. **Sources:** Industry and government sources, C&EN estimates

Excess capacity less a problem for chemical process industries in 1983

	Operating rate, % of nameplate capacity, as of December										
	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Chemicals	71%	65%	69%	80%	83%	83%	79%	78%	77%	72%	84%
Paper	96	86	85	93	94	92	89	85	85	78	95
Rubber	93	75	75	81	83	89	87	85	79	74	94
Petroleum	71	72	77	77	87	93	91	93	88	89	93
Textiles	89	75	75	83	91	88	87	81	88	67	93
All manufacturing	79	69	74	81	85	87	83	81	77	75	87

Source: Federal Reserve Board

ENERGY USE BY CHEMICAL INDUSTRY: Total use declines, led by cuts in natural gas

Energy source[a]	1983 Trillion Btu	1983 % of total	1982 Trillion Btu	1982 % of total	1981 Trillion Btu	1981 % of total	1980 Trillion Btu	1980 % of total	1972 Trillion Btu	1972 % of total	Change 1972–83 Trillion Btu	Change 1972–83 %
Natural gas	**994**	**37.5%**	**1051**	**38.7%**	**1272**	**40.2%**	**1293**	**39.7%**	**1570**	**47.3%**	**−576**	**−36.7%**
Purchased electricity[b]	**803**	**30.3**	**811**	**29.9**	**931**	**29.4**	**943**	**29.0**	**732**	**22.1**	**71**	**9.7**
Petroleum-based fuels	**451**	**17.0**	**472**	**17.4**	**542**	**17.1**	**621**	**19.1**	**592**	**17.8**	**−141**	**−23.8**
Light hydrocarbons[c]	301	11.3	325	12.0	351	11.1	380	11.7	333	10.0	−32	−9.6
Residual fuels	90	3.4	88	3.2	104	3.3	141	4.3	161	4.8	−71	−44.1
Distillate fuels	12	0.5	14	0.5	18	0.6	23	0.7	34	1.0	−22	−64.7
Other fuel[d]	47	1.8	45	1.7	70	2.2	77	2.4	65	1.9	−18	−27.7
Coal and coke	**318**	**12.0**	**295**	**10.9**	**324**	**10.2**	**301**	**9.3**	**294**	**8.9**	**24**	**8.2**
Purchased steam	**85**	**3.2**	**83**	**3.1**	**98**	**3.1**	**95**	**2.9**	**128**	**3.9**	**−43**	**−33.6**
TOTAL	**2652**	**100.0%**	**2712**	**100.0%**	**3167**	**100.0%**	**3255**	**100.0%**	**3316**	**100.0%**	**−664**	**−20.0%**

a For energy and process use only, excluding energy equivalent of feedstock. b Electricity is calculated as fuel value of 10,000 Btu to generate 1 kWh instead of using standard conversion factor of 3412 Btu per kWh. c Includes propane, liquefied petroleum gas, and other gases. d Includes petroleum coke, gasoline, and other liquids and solids. **Note:** Data from companies accounting for about 90% of U.S. capacity for basic industrial chemicals. **Source:** Chemical Manufacturers Association

ENERGY USE BY FERTILIZER INDUSTRY: Total is down sharply for the second year

Energy source[a]	1983 Trillion Btu	1983 % of total	1982 Trillion Btu	1982 % of total	1981 Trillion Btu	1981 % of total	1980 Trillion Btu	1980 % of total	1972 Trillion Btu	1972 % of total	Change 1972–83 Trillion Btu	Change 1972–83 %
Natural gas	**125.6**	**77.6%**	**151.8**	**76.8%**	**200.6**	**81.2%**	**205.0**	**79.3%**	**161.3**	**79.3%**	**−35.7**	**−22.1%**
Purchased electricity[b]	**31.9**	**19.7**	**33.7**	**17.1**	**43.7**	**17.7**	**46.9**	**18.2**	**35.3**	**17.4**	**−3.4**	**−9.6**
Petroleum-based fuels	**0.4**	**0.3**	**4.4**	**2.3**	**1.8**	**0.7**	**5.8**	**2.2**	**6.2**	**3.1**	**−5.8**	**−92.8**
Residual fuels	0.4	0.2	4.4	2.2	1.0	0.4	4.5	1.7	3.8	1.9	−3.5	−90.7
Distillate fuels	na	na	na	na	0.7	0.3	0.7	0.3	2.2	1.1	na	na
Other fuel[c]	0.1	0.1	0	0	0.2	0.1	0.6	0.2	0.2	0.1	−0.1	−48.9
Coal and coke	**na**	**na**	**na**	**na**	**0.5**	**0.2**	**0.6**	**0.2**	**0.5**	**0.2**	**na**	**na**
Generated steam[d]	**3.9**	**2.4**	**7.6**	**3.8**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Purchased steam	**0**	**0**	**0**	**0**	**0.4**	**0.1**	**0.2**	**0.1**	**0.1**	**0**	**−0.1**	**100**
TOTAL	**161.8**	**100.0%**	**197.6**	**100.0%**	**246.9**	**99.9%**	**258.5**	**100.0%**	**203.3**	**100.0%**	**−41.5**	**−20.4%**

a For energy and process use only, excluding energy equivalent of feedstock. b Electricity is calculated as fuel value of 10,000 Btu to generate 1 kWh instead of using standard conversion factor of 3412 Btu per kWh. c Includes propane, liquefied petroleum gas, gasoline, diesel oil, kerosine, and other fuels. d Steam generated from fossil fuel, listed prior to 1982 under residual fuels, distillate fuels, other fuel, and coal and coke. na = not available. **Note:** Data from companies accounting for more than 70% of U.S. ammonia capacity. **Source:** Fertilizer Institute

ENERGY USE BY PETROLEUM INDUSTRY: Two thirds comes from petroleum itself

Energy source[a]	1983 Trillion Btu	1983 % of total	1982 Trillion Btu	1982 % of total	1981 Trillion Btu	1981 % of total	1980 Trillion Btu	1980 % of total	1972 Trillion Btu	1972 % of total	Change 1972–83 Trillion Btu	Change 1972–83 %
Natural gas	**565**	**22.3%**	**591**	**22.4%**	**686**	**24.7%**	**734**	**25.1%**	**951**	**33.6%**	**−386**	**−40.6%**
Purchased electricity[b]	**244**	**9.6**	**242**	**9.1**	**250**	**9.0**	**253**	**8.6**	**186**	**6.6**	**58**	**31.2**
Petroleum-based fuels	**1696**	**66.9**	**1781**	**67.5**	**1810**	**65.1**	**1903**	**65.1**	**1655**	**58.4**	**41**	**2.5**
Light hydrocarbons[c]	1118	44.1	1189	45.0	1194	43.0	1243	42.5	985	34.8	133	13.5
Residual fuels	134	5.3	149	5.6	177	6.4	215	7.3	240	8.5	−106	−44.2
Petroleum coke	433	17.1	429	16.2	428	15.4	425	14.5	407	14.4	26	6.4
Other fuel[d]	11	0.4	15	0.5	11	0.4	19	0.7	23	0.8	−12	−52.2
Coal and coke	**7**	**0.3**	**6**	**0.2**	**5**	**0.2**	**4**	**0.1**	**5**	**0.2**	**2**	**40.0**
Purchased steam	**23**	**0.9**	**20**	**0.8**	**28**	**1.0**	**31**	**1.1**	**35**	**1.2**	**−12**	**−34.3**
TOTAL	**2534**	**100.0%**	**2640**	**100.0%**	**2779**	**100.0%**	**2925**	**100.0%**	**2832**	**100.1%**	**−298**	**−10.5**

a For energy and process use only, excluding energy equivalent of feedstock. b Electricity is calculated as fuel value of 10,000 Btu to generate 1 kWh instead of using standard conversion factor of 3412 Btu per kWh. c Includes propane, liquefied petroleum gas, and refinery gas. d Includes distillate fuels, gasoline, and other liquids. **Note:** Data from companies accounting for about 85% of U.S. petroleum refining capacity, including Puerto Rico. **Source:** American Petroleum Institute

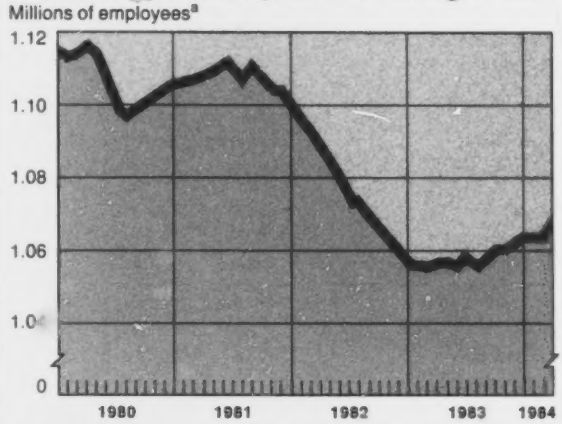
Little growth yet for chemical workforce

In 1983, the number of workers employed by the U.S. chemical industry hovered near 1,058,000—well below 1982 and the lowest level of employment since 1976. The steep drop in jobs throughout 1982 bottomed out, however. Moreover, the second half of 1983 and early 1984 show a small but steady trend toward higher employment rates.

Although the chemical industry as a whole had a net loss of jobs in 1983, compared to 1982, the chemical products sector added employees. Manufacturers of drugs, soaps and toiletries, and paints increased the number of both supervisory and production workers during the year. It is interesting that production workers in these fields earn lower wages than the industry average. The highest-paid workers are in sectors that lost production jobs during 1983—industrial inorganic and organic chemicals.

Major chemical firms continued to cut workforces in 1983, though not so severely as in 1982. But some of the smaller employers, among them International Flavors, Olin, and Pennwalt, added employees.

Employment in the chemical industry remained near four-year low through 1983



a Seasonally adjusted employment in U.S. chemicals and allied products industry; March and April 1984 figures are preliminary. **Source:** Department of Labor

INDUSTRIAL EMPLOYMENT: Still below 1981 levels for most of chemical industry

	All employees[a] (thousands)				Production workers[a] (thousands)				Workweek[a,b] (hours)			
	1983	1982	1981	1973	1983	1982	1981	1973	1983	1982	1981	1973
All manufacturing	18,678	18,853	20,170	20,154	12,696	12,790	14,020	14,834	40.1	38.9	39.8	40.7
Chemicals and allied products	1,058	1,079	1,109	1,038	588	601	628	610	41.6	40.9	41.6	41.8
Industrial inorganic chemicals	153	160	162	143	78	85	88	88	41.5	40.4	41.5	42.1
Plastics materials and synthetics	179	186	196	242	116	120	130	160	42.0	40.6	42.0	41.7
Drugs	201	199	199	161	99	98	99	83	41.0	41.1	41.1	41.7
Soap, cleaners, and toilet goods	151	146	146	126	94	92	92	72	41.1	40.6	40.4	40.8
Paints and allied products	62	61	63	69	30	29	31	39	40.9	39.6	40.4	41.4
Industrial organic chemicals	162	171	178	147	83	86	90	78	42.5	41.9	42.8	42.7
Agricultural chemicals	61	65	70	59	37	40	44	37	42.1	42.0	43.0	42.5
Miscellaneous chemical products	90	91	94	90	51	51	54	54	41.3	40.5	41.3	41.6
Petroleum and coal products	196	201	214	193	118	120	134	124	43.9	43.9	43.2	42.4
Rubber and miscellaneous plastics products	727	701	737	692	562	536	569	547	41.2	39.6	40.3	41.1

a Domestic employment. b Workweek of production or nonsupervisory workers. **Source:** Department of Labor

EMPLOYMENT OF SCIENTISTS, ENGINEERS: Climbs to new high in chemicals

Thousands[a]	1983[b]	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Total, all industry	535.6	509.8	487.8	450.6	423.9	404.4	382.8	364.4	363.3	360.0	357.7
Chemicals and allied products	67.1	61.6	54.7	51.4	50.0	48.3	46.4	44.4	45.2	41.8	40.9
Industrial chemicals	26.4	25.9	21.6	20.9	21.4	21.3	20.6	20.1	21.1	19.1	19.1
Drugs and medicines	30.0	25.6	23.3	21.6	20.8	19.5	17.8	16.6	15.6	14.0	13.0
Other chemicals	10.7	10.1	9.8	8.9	7.8	7.5	8.0	7.8	8.5	8.7	8.8
Petroleum refining	15.1	15.6	13.0	10.8	10.1	9.9	8.9	8.6	8.4	8.2	8.2
Rubber products	na	8.1	10.3	na	8.1	7.9	9.1	8.6	8.4	7.7	7.5

a Full-time-equivalent number of R&D scientists and engineers in industry, as of January of each year. b Preliminary. na = not available separately but included in total. **Source:** National Science Foundation

CHEMICAL EMPLOYMENT: Down for third straight year in 1983

Thousands	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
Air Products	16.7	18.9	16.2	15.8	14.6	14.3	13.7	13.4	13.0	13.0
American Cyanamid	38.7	40.2	41.8	42.6	44.2	44.0	43.8	39.4	37.8	38.0
Celanese	23.3	25.3	35.9	36.5	33.3	33.2	32.1	31.9	37.0	38.8
Crompton & Knowles	2.4	2.3	2.5	2.8	3.0	3.2	3.1	3.0	2.2	2.4
Dow Chemical	54.5	56.6	63.8	56.8	55.9	53.5	53.2	53.0	53.0	53.3
Ethyl	13.0	14.0	14.5	15.0	16.0	16.5	16.0	16.0	17.0	18.0
Freeport-McMoRan	4.8	5.0	5.2	2.7	3.9	3.5	3.7	3.8	3.5	3.3
H. B. Fuller	4.1	4.0	3.3	3.4	3.4	3.3	3.0	2.8	2.6	2.3
W. R. Grace	78.5	82.2	89.0	91.7	82.1	68.5	68.7	63.8	65.3	79.1
Hercules	24.2	24.5	22.8	22.9	24.4	24.5	24.0	24.0	23.5	25.3
International Flavors	3.7	3.6	3.6	3.6	3.6	3.5	3.3	3.1	2.9	3.1
International Minerals	8.4	8.4	10.6	10.6	10.3	9.9	9.9	9.7	10.5	6.6
Lubrizol	4.2	4.3	4.2	4.2	3.9	3.8	3.6	3.6	3.6	3.5
Monsanto	50.9	51.2	57.4	61.8	63.9	62.9	61.5	61.9	59.2	60.9
Nalco Chemical	4.6	4.6	4.7	4.4	4.1	4.1	4.2	3.8	3.5	3.4
Olin	18.2	17.5	20.3	21.0	21.7	22.7	22.4	22.0	23.0	23.0
Pennwalt	9.8	9.5	10.7	12.8	13.3	14.0	13.9	13.9	14.3	14.8
PPG Industries	37.0	37.0	36.6	37.3	38.2	37.4	36.6	36.3	34.9	38.0
Reichhold Chemicals	3.6	4.5	5.6	5.6	6.4	6.5	6.5	5.8	4.3	4.1
Rohm & Haas	11.4	11.5	13.5	13.2	13.3	13.1	13.0	13.3	13.8	14.2
Stauffer Chemical	9.7	11.0	12.2	13.4	13.8	13.1	13.0	13.0	13.1	12.5
Stepan Chemical	0.9	0.9	0.9	0.8	0.9	0.8	0.8	0.7	0.7	0.8
Union Carbide	99.5	103.2	110.3	116.1	115.8	113.4	113.7	113.1	106.5	109.6
TOTAL EMPLOYEES	**522.0**	**540.3**	**585.6**	**595.0**	**590.0**	**569.7**	**563.7**	**551.3**	**545.2**	**568.0**
ANNUAL CHANGE	**−3.4%**	**−7.7%**	**−1.6%**	**0.8%**	**3.6%**	**1.1%**	**2.2%**	**1.1%**	**−4.0%**	**4.9%**
SALES PER EMPLOYEE ($ thousands, current)	**$116.6**	**$110.7**	**$110.9**	**$103.5**	**$95.8**	**$91.1**	**$74.7**	**$68.8**	**$51.3**	**$57.5**
SALES PER EMPLOYEE ($ thousands, constant 1972[a])	**$ 41.5**	**$ 39.5**	**$ 40.2**	**$ 41.4**	**$44.9**	**$47.8**	**$40.4**	**$38.3**	**$29.5**	**$40.8**

a Based on producer price index for chemicals and allied products. **Note:** Data for years prior to 1982 are not restated for acquisitions and similar adjustments.

WAGES: Workers in the chemical industry earn more than average for all industry

	Hourly earnings[a]				Weekly earnings[a]			
	1983	1982	1981	1973	1983	1982	1981	1973
All manufacturing	$ 8.84	$ 8.50	$ 7.99	$4.09	$354.48	$330.65	$318.00	$166.46
Chemicals and allied products	10.59	9.96	9.12	4.51	440.54	407.36	379.39	188.52
Industrial inorganic chemicals	11.72	11.02	10.16	4.88	486.38	445.21	421.64	205.45
Plastics materials and synthetics	10.55	9.87	9.01	4.31	443.10	400.72	378.42	179.73
Drugs	9.70	9.08	8.29	4.34	397.70	373.19	340.72	180.98
Soap, cleaners, and toilet goods	9.67	9.13	8.38	4.41	397.44	370.68	338.55	179.93
Paints and allied products	9.33	8.80	8.03	4.24	381.60	348.48	324.41	175.54
Industrial organic chemicals	12.73	11.85	10.72	5.22	541.03	496.52	458.82	222.89
Agricultural chemicals	10.31	9.71	8.89	4.06	434.05	407.82	382.27	172.55
Miscellaneous chemical products	9.65	9.22	8.44	4.32	398.55	373.41	348.57	179.71
Petroleum and coal products	13.28	12.46	11.91	5.28	582.99	546.99	491.62	223.87
Rubber and miscellaneous plastics products	8.02	7.65	7.17	3.81	330.42	302.94	288.95	156.59

a For production and nonsupervisory workers in domestic employment. **Source:** Department of Labor

U.S. chemical surplus continues to narrow

Nobody really believes that growth in world chemical trade has come to an end. But, based on the record, scattered doubts are understandable.

Last year, world chemical trade, measured as exports, dropped 6% to $127.8 billion for the third decline in a row. This is a dramatic reversal from the past; world chemical trade grew an average 21% per year between 1970 and 1980. Given the improved economic outlook in most of the world's industrialized nations, world chemical trade probably will revert to growth again this year. But it will be several years before it returns to its 1980 record level of $147 billion.

Virtually all of the world's major chemical exporting countries suffered a drop in chemical shipments last year. The U.S. was no exception.

The U.S. chemical trade surplus took another nosedive last year, not only because chemical exports dropped but also because chemical imports surged. The drop in exports was only slight—less than 1% to $19.75 billion. By comparison, the jump in chemical imports was an astonishing 14%, topping the $10 billion mark for the first time and setting a new record at $10.8 billion.

As a result, the chemical industry's treasured trade surplus shrank 14% from $10.4 billion to $9.0 billion. That's the third successive decline for the U.S. chemical trade surplus, dropping it to the lowest that it has been since 1978.

Chemical imports, of course, benefited from the strong U.S. economy and from an all-too-strong U.S. dollar. The strong dollar makes imports very competitive with domestic products.

On the other hand, U.S. chemical exports were hurt by the strong U.S. dollar. The economic recovery in other countries also has lagged that in the U.S. As a result, overseas demand for U.S. chemicals wasn't strong. Meanwhile, the staggering debts of many developing nations make it difficult, if not impossible, for them to do much importing.

U.S. TOTAL TRADE BALANCE:
The deficit grows ominously

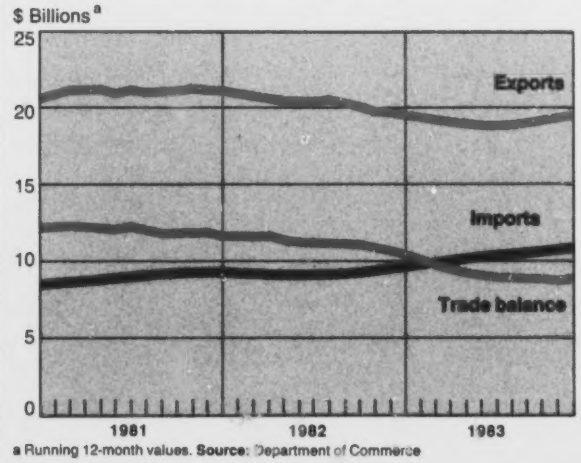
$ Billions	1983	1982	1981	1973
Exports	$200.5	$212.2	$233.7	$70.8
Imports	258.0	244.0	261.0	69.5
Trade balance	−57.5	−31.8	−27.3	1.3

Source: Department of Commerce

U.S. CHEMICAL TRADE BALANCE:
The surplus is dwindling

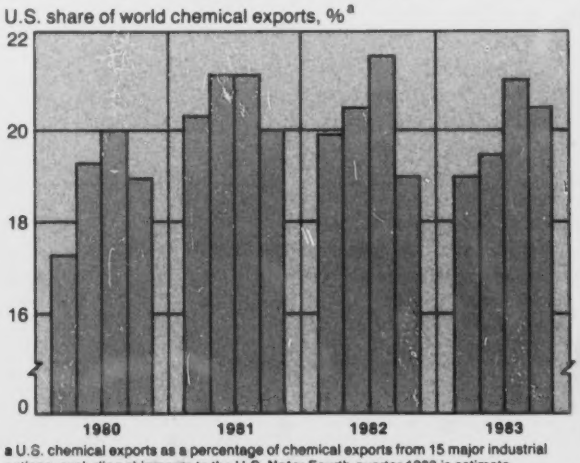
$ Millions	1983	1982	1981	1973
Chemical exports	$19,751	$19,891	$21,187	$5748
Chemical imports	10,779	9,494	9,446	2437
Chemical trade balance	8,972	10,397	11,741	3311

Import rise cuts chemical trade balance . . .



a Running 12-month values. **Source:** Department of Commerce

. . . but U.S. clings to fifth of world markets



a U.S. chemical exports as a percentage of chemical exports from 15 major industrial nations, excluding shipments to the U.S. **Note:** Fourth-quarter 1983 is estimate. **Source:** Department of Commerce

WORLD TRADE: Recession cuts exports

$ Millions	1983	1982	1981	1973
CHEMICAL EXPORTS				
World	$127,800[a]	$136,500[a]	$142,983	$40,315
U.S.	19,751	19,891	21,187	5,748
Canada	3,603	3,406	4,002	753
EC, 10 countries	60,653	67,598	69,452	22,558
Belgium-Luxembourg	5,807	6,173	6,477	2,313
France	9,830	11,708	12,141	3,524
Italy	4,619	5,296	5,214	1,652
Netherlands	9,318	9,982	10,418	3,413
U.K.	7,978	10,687	10,831	3,120
West Germany	20,623	21,185	21,966	7,944
Switzerland	5,546	5,440	5,505	2,021
Japan	6,983	6,365	6,841	2,147
CHEMICAL IMPORTS				
U.S.	10,779	9,494	9,446	2,437
Canada	3,973	3,310	3,569	1,230
EC, 10 countries	49,765	50,226	51,483	16,022
Belgium-Luxembourg	5,158	5,143	5,235	1,664
France	9,473	9,898	10,376	3,112
Italy	7,250	6,890	7,020	2,263
Netherlands	5,353	5,473	5,726	1,911
U.K.	6,799	7,318	7,260	2,200
West Germany	12,190	12,031	12,201	3,572
Switzerland	3,300	3,208	3,226	1,141
Japan	7,207	6,824	6,487	1,865

a C&EN estimates. **Sources:** United Nations, Organization for Economic Cooperation & Development, European Communities, individual country data

U.S. TRADE: Developing areas buy less

$ Millions	1983	1982	1981	1973
U.S. CHEMICAL EXPORTS				
Canada	$ 2,546	$ 2,183	$ 2,478	$ 844
Western Europe	5,892	5,940	6,155	1,905
Eastern Europe	306	366	347	30
Communist Asia	353	497	406	8
Japan	2,607	2,530	2,349	629
Rest of Asia	2,859	2,600	2,597	575
Middle East	423	533	517	119
Latin America	3,273	3,670	4,469	1,165
Australasia	696	655	778	212
Africa	492	524	642	172
Other	304	393	449	89
TOTAL	**$19,751**	**$19,891**	**$21,187**	**$5,748**
U.S. CHEMICAL IMPORTS				
Canada	$2,390	$2,596	$2,916	$ 554
Western Europe	5,020	4,174	3,931	1,186
Eastern Europe	197	151	131	19
Communist Asia	131	136	126	8
Japan	1,099	879	956	239
Rest of Asia	283	220	197	36
Middle East	113	99	110	13
Latin America	924	613	669	94
Australasia	234	286	186	151
Africa	227	225	117	22
Other	161	115	107	115
TOTAL	**$10,779**	**$9,494**	**$9,446**	**$2,437**

Source: Department of Commerce

U.S. TRADE, BY PRODUCTS: Plastics and drugs buck general decline in exports

$ Millions	Chemical exports 1983	1982	1981	1973	Chemical imports 1983	1982	1981	1973
Organic chemicals	$ 5,326	$ 5,440	$ 5,929	$1582	$ 3,477	$2960	$2974	$ 636
Inorganic chemicals	1,838	1,969	2,286	544	1,615	1502	1573	523
Radioactive and associated materials	1,213	1,132	988	284	952	1143	786	151
Dyeing, tanning, and coloring materials	163	162	175	90	300	213	226	111
Pigments, paints, and varnishes	328	332	349	126	145	103	102	21
Medicinals and pharmaceuticals	2,494	2,275	2,165	626	703	563	583	164
Flavors, perfumes, cosmetics, and toiletries	493	514	535	141	370	295	289	125
Cleaning and polishing materials	295	324	396	122	90	76	74	19
Fertilizers, manufactured	1,267	1,386	1,735	407	997	963	1181	280
Explosives and pyrotechnics	87	90	90	31	64	67	61	27
Plastics and resins	3,732	3,650	3,809	1028	1,098	766	780	207
Pesticides and disinfectants	630	607	544	a	251	265	283	a
Miscellaneous chemical products	1,885	2,010	2,187	767	717	579	534	174
TOTAL	**$19,751**	**$19,891**	**$21,187**	**$5748**	**$10,779**	**$9494**	**$9446**	**$2437**

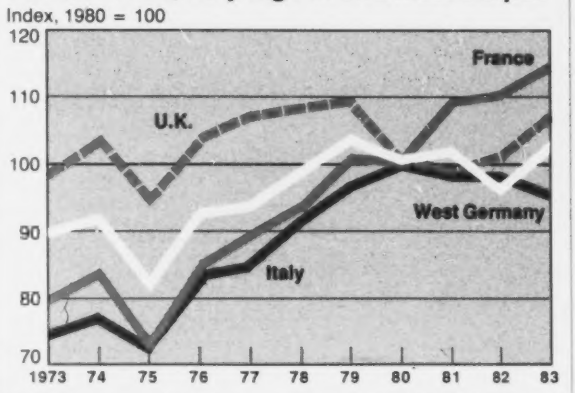
a Included in miscellaneous. **Source:** Department of Commerce

Foreign Chemical Industries–Western Europe 6

West European chemical industry executives are justifiably pleased with 1983's business outcome. Sales were up nearly everywhere. More to the point, many companies registered significant gains in earnings. Only one major company, Italy's Montedison, lost money, but even it trimmed its loss to less than half what it had been in 1982. France's Rhône-Poulenc turned the corner into profitability following three years in the red.

Several factors contributed to higher profits. Operating economies that had been introduced during the two previous years began to pay off last year. An upswing in demand coupled with earlier plant shutdowns raised the operating rates of plants that were running. And prices firmed, particularly for commodity chemicals.

France leads, Italy lags in chemical output



CHEMICAL INDUSTRY TRENDS: Currency weaknesses undercut growth in dollar values

$ Billions (U.S.)	1983	1982	1981	1980	1979
WEST GERMANY					
Sales	$ 49.7	$ 48.5	$ 51.6	$ 59.2	$ 56.0
Exports	24.0	22.9	23.8	26.0	24.0
Imports	13.6	13.0	13.3	14.6	13.2
Capital spending	2.7	2.8	3.1	3.8	3.3
Production index (1980 = 100)	103.4	96.4	101.6	100.0	104.3
Price index (1980 = 100)	113.9	113.7	108.7	100.0	92.7
Employees (thousands)	549	559	548	550	547
FRANCE					
Sales	$ 30.6	$ 30.4	$ 33.4	$ 37.3	$ 32.9
Exports	11.5	11.2	11.9	13.0	11.5
Imports	8.9	9.1	9.2	10.4	8.9
Capital spending	1.0	1.1	1.2	1.6	1.4
Production index (1980 = 100)	114.9	110.2	108.8	100.0	95.6
Price index (1980 = 100)	139.0	127.5	114.2	100.0	84.0
Employees (thousands)	275	286	289	296	301
U.K.[a]					
Sales	$ 27.2	$ 28.2	$ 37.6	$ 41.0	$ 35.6
Exports	10.5	11.5	12.3	12.3	10.4
Imports	7.8	8.2	7.9	7.3	7.2
Capital spending	1.2	1.9	2.5	3.2	2.5
Production index (1980 = 100)	106.6	100.8	98.7	100.0	108.5
Price index (1980 = 100)	119.0	113.5	106.3	100.0	86.4
Employees (thousands)	327	338	395	430	441
ITALY					
Sales	$ 22.1	$ 22.7	$ 24.1	$ 28.7	$ 23.7
Exports	5.7	5.0	5.6	5.9	5.2
Imports	7.9	7.4	7.8	9.0	7.9
Capital spending	1.1	1.1	1.1	1.9	1.7
Production index (1980 = 100)	95.1	98.3	98.1	100.0	96.4
Price index (1980 = 100)	134.9	124.1	111.9	100.0	82.9
Employees (thousands)	251	260	271	289	291
SPAIN					
Sales	$ 14.2	$ 15.2	$ 15.7	$ 17.3	$ 15.4
Exports	2.2	2.2	2.3	2.5	2.0
Imports	2.8	2.9	3.1	3.5	3.1
Capital spending	0.3	0.4	0.4	0.7	0.6
Production index (1980 = 100)	104.5	100.0	98.3	100.0	102.9
Price index (1980 = 100)	147.4	131.0	116.9	100.0	83.8
Employees (thousands)	242	243	244	244	245

$ Billions (U.S.)	1983	1982	1981	1980	1979
BELGIUM					
Sales	$ 13.2	$ 14.1	$ 15.3	$ 16.6	$ 14.4
Exports	8.8	8.9	9.2	10.4	9.3
Imports	6.3	6.3	6.4	7.5	6.6
Capital spending	0.3	0.3	0.4	0.5	0.5
Production index (1980 = 100)	108.1	103.1	101.1	100.0	105.6
Price index (1980 = 100)	133.7	126.0	110.7	100.0	88.4
Employees (thousands)	88	88	88	90	82
NETHERLANDS					
Sales	$ 13.1	$ 12.5	$ 13.6	$ 14.3	$ 13.5
Exports	12.0	11.3	11.9	13.0	11.8
Imports	6.8	6.7	7.1	7.9	7.0
Capital spending	0.7	0.6	0.6	0.7	0.6
Production index (1980 = 100)	110.0	100.0	97.7	100.0	103.0
Price index (1980 = 100)	115.0	114.0	114.4	100.0	91.2
Employees (thousands)	88	90	91	91	92
SWITZERLAND					
Sales	$ 6.7	$ 6.6	$ 6.7	$ 6.8	$ 6.6
Exports	5.5	5.4	5.4	5.6	5.3
Imports	3.3	3.3	3.3	3.7	3.2
Production index (1980 = 100)	109.6	103.0	104.2	100.0	97.6
Price index (1980 = 100)	106.4	106.8	104.9	100.0	93.5
Employees (thousands)	68	na	63	62	62
SWEDEN					
Sales	$ 4.0	$ 4.0	$ 4.1	$ 4.3	$ 3.9
Exports	1.8	1.6	1.6	1.7	1.5
Imports	2.7	2.6	2.5	2.9	2.7
Capital spending	0.2	0.3	0.3	0.4	0.4
Production index (1980 = 100)	116.5	104.8	109.4	100.0	115.2
Price index (1980 = 100)	135.5	120.4	108.8	100.0	87.5
Employees (thousands)	44	44	41	39	40
NORWAY					
Sales	$ 2.0	$ 2.0	$ 1.9	$ 2.1	na
Exports	1.1	1.0	1.5	1.2	$ 0.9
Imports	0.9	0.9	1.0	1.1	1.0
Capital spending	0.1	0.1	0.1	0.2	0.1
Production index (1980 = 100)	104.0	100.6	101.7	100.0	90.0
Price index (1980 = 100)	123.6	117.9	112.5	100.0	80.9
Employees	19	18	17	17	17

a Excludes fibers. **na** = not available. **Sources:** National chemical federations and Conseil Européen des Fédérations de l'Industrie Chimique

MAN-MADE FIBERS: Output of noncellulosics bounced back in 1983

Millions of lb	1983		1982		1981		1980		1979		Change, 1982–83	
	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics
West Germany	1667	331	1511	315	1735	322	1619	304	1725	295	10%	5%
Italy	1166[b]	65	1091[b]	102	1115[b]	133	896[b]	144	988	156	7	−36
U.K.	541[c]	330[d]	506[c]	263[d]	612[c]	298[d]	700[c]	364[d]	838	504	7	25
Spain	539	70	507	95	518	111	452	116	466	128	6	−26
France	436	83	434	100	444	119	423	146	493	169	0	−17
Switzerland	203	0	183	0	197	0	186	4	185	7	11	—
Benelux countries	183	134	198	124	228	144	230	148	286	165	−8	8
Austria	53	251	51	251	53	257	56	255	62	242	4	0
Ireland	na	0	114	0	110	0	92	0	86	0	—	—
Portugal	na	na	99	3	75	9	67	6	68	7	—	—

a Excludes polypropylene filament unless otherwise indicated. b Includes polypropylene filament. c Includes cellulose acetate filament. d Excludes cellulose acetate filament. na = not available.
Source: Comité International de la Rayonne et des Fibres Synthétiques

PRODUCTION: Volume was up from 1982, but often not to earlier levels

Millions of lb	1983	1982	1981	1980	Change 1982–83
FRANCE					
Sulfuric acid	9024	8858	9917	10,894	2%
Hydrochloric acid	1483	1514	1544	1,487	−2
Chlorine	2872	2759	2711	2,765	4
Sodium hydroxide	3064	2939	2893	2,946	4
Ammonia	4312	4180	4950	4,587	3
Benzene	1373	1133	1100	1,204	21
Toluene	90	69	124	140	30
Xylenes	199	113	251	172	76
Ethylene	4563	4112	4085	4,561	11
Propylene	2455	2277	2212	2,174	8
Butadiene	620	569	586	572	9
Formaldehyde	208	175	220	254	19
Methanol	761	753	765	757	1
Polyethylenes	2070	1938	1944	2,364	7
Polypropylene	842	692	656	464	22
Polystyrene	734	680	577	559	8
Polyvinyl chloride	1796	1729	1563	1,596	4
Synthetic rubber	1125	1045	1070	1,124	8
Phosphate fertilizers (P_2O_5)	1577	2447	2590	2,965	−36
ITALY					
Sulfuric acid	4999	5150	5597	6,220	−3%
Nitric acid	2289	2265	2212	2,232	1
Phosphoric acid	816	932	979	1,044	−12
Chlorine	1958	1592	1556	1,821	23
Sodium hydroxide	2229	1868	1857	2,097	19
Ammonia	2636	2709	3239	3,770	−3
Benzene	1142	841	932	909	36
Toluene	660	587	613	631	12
Xylenes	742	594	564	625	25
Ethylene	2126	1918	2011	2,364	11
Propylene	1017	978	1083	1,426	4
Butadiene	429	350	366	403	23
Phthalic anhydride	299	299	309	310	0
Formaldehyde	250	224	240	288	12
Acetic acid	241	347	401	430	−31
Carbon black	319	334	337	378	−4
Polyethylenes	1456	1159	1223	1,645	26
Polystyrene	710	667	637	714	6
Polyvinyl chloride	1457	1292	1282	1,480	13
Synthetic rubber	501	475	535	569	5
U.K.					
Sulfuric acid	5787	5692	6360	7,440	2%
Hydrochloric acid[a]	259	260	257	302	0
Nitric acid	6890	6784	6541	6,215	2
Chlorine	1977	1935	1916	2,004	2
Benzene	1743	1399	1799	1,978	25
Ethylene	2540	2454	2718	2,409	3
Propylene	1719	1695	1621	1,260	1
Butadiene	523	503	457	422	4
Acetone	268	298	245	270	−10
Formaldehyde	226	236	249	273	−4
Phenol	315	308	241	310	2
Polyethylenes	900	937	1000	957	−4
Polypropylene	506	487	435	418	4
Polystyrene	301	254	302	345	18
Synthetic rubber	571	537	493	466	6
Nitrogen fertilizers (N)[a]	3148	2777	2784	2535	13
Phosphate fertilizers (P_2O_5)[a]	962	838	842	835	15
WEST GERMANY					
Sulfuric acid	8107	8334	9018	9,054	−3%
Hydrochloric acid	1980	1865	1953	1,960	6
Nitric acid	5778	5040	6356	6,994	15
Chlorine	6900	6253	6629	6,592	10
Sodium hydroxide	6830	6318	6687	6,595	8
Sodium sulfate	297	472	561	496	−37
Sodium carbonate	2678	2432	2616	3,104	10
Ammonia	4495	4145	5179	5395	8
Benzene	2939	2258	2027	2,022	30
Toluene	691	590	578	573	17
Xylenes	1127	1012	1071	783	11
Ethylene	6980	5808	6357	6,744	20
Propylene	3793	3259	3550	3,501	16
Butadiene	1580	1275	na	na	24
Ethylene oxide	993	866	955	847	15
Ethylene glycol	451	404	487	459	12
Acetaldehyde	692	571	670	736	21
Acetic acid	590	562	646	631	5
Ethanol	172	220	222	238	−22
Formaldehyde	1144	1070	1117	1,059	7
Methanol	1470	1559	1524	1,810	−6
Phthalic anhydride	429	439	474	494	−2
Polyethylenes	2997	2473	2639	3,080	21
Polyvinyl chloride	2398	1902	2021	2,097	26
Synthetic rubber	951	888	914	900	7
Nitrogen fertilizers (N)	1639	1464	2191	2,449	12
Phosphate fertilizers (P_2O_5)	571	595	732	841	−4

a Manufacturers' sales. na = not available. **Sources:** Government agencies for each country

COMPANY RESULTS: Profits recover but capital outlays and employment generally fall

$ Millions	Net sales	Net income	Profit margin	Capital spending	R&D spending	Employees (thousands)
Bayer (West Germany)						
1983	$14,641.6	$295.7	2.0%	$ 734.1	$664.3	174.8
1982	14,335.0	26.3	0.2	846.6	637.9	179.4
1981	14,930.1	228.8	1.5	1123.5	622.1	180.9
1980	15,837.9	401.1	2.5	1461.0	681.9	181.6
Hoechst (West Germany)						
1983	$14,583.9	$356.5	2.4%	$ 733.3	$634.1	179.8
1982	14,397.5	130.5	0.9	850.6	642.4	182.2
1981	15,236.7	188.5	1.2	870.4	670.4	184.7
1980	16,436.8	305.5	1.9	1053.8	714.8	186.9
BASF (West Germany)						
1983	$13,769.0	$202.7	1.5%	$ 639.2	$466.3	114.1
1982	13,368.7	113.2	0.8	824.3	483.1	115.9
1981	14,055.8	162.4	1.2	911.1	484.1	116.6
1980	15,236.8	197.3	1.3	1011.5	545.6	116.5
Imperial Chemical Industries (U.K.)						
1983	$12,528.1	$602.4[a]	4.8%	$ 547.8	$418.8	117.9
1982	12,886.2	253.9	2.0	511.4	427.3	123.8
1981	13,348.9	389.5[b]	2.9	833.7	464.5	132.4
1980	13,290.7	302.3[c]	2.3	1683.7	493.0	143.2
Ciba-Geigy (Switzerland)						
1983	$7,019.5	$369.5	5.3%	$395.2	$594.3	79.2
1982	6,802.0	306.4	4.5	427.6	578.8	79.4
1981	6,938.3	265.8	3.8	446.4	549.0	80.2
1980	7,134.1	182.6	2.6	510.8	561.1	81.1
Montedison (Italy)						
1983	$7,017.8	($207.4)[d,e]	—	$295.6	$171.2	72.8
1982	6,665.9	(529.9)[d,f]	—	324.5	170.7	84.2
1981	7,851.3	(564.6)[d]	—	377.3	175.0	94.2
1980	9,090.0	(523.4)[d]	—	450.9	205.6	105.5
DSM (Netherlands)						
1983	$6,937.9	$57.5	0.8%	$212.3	$61.4	27.9
1982	6,806.0	(70.3)[d]	—	165.5	63.7	28.6
1981	7,330.4	40.4	0.6	196.8	64.0	30.0
1980	7,496.5	12.6	0.2	258.3	75.4	31.4
Rhône-Poulenc (France)						
1983	$5,658.4	$ 12.9	0.2%	$365.6	$288.7	80.0
1982	5,661.5	(128.5)[d]	—	329.7	267.6	81.8
1981	6,604.6	(61.6)[d]	—	447.8	279.8	89.3
1980	7,156.2	(461.4)[d]	—	613.0	323.9	95.4
Akzo (Netherlands)						
1983	$5,293.0	$189.1[g]	3.6%	$219.3	$217.5	66.3
1982	5,301.1	85.0[h]	1.6	273.4	232.2	73.7
1981	5,790.4	95.6[i]	1.6	277.2	234.0	77.8
1980	6,257.8	89.9[j]	1.4	324.1	258.8	83.1
Norsk Hydro (Norway)						
1983	$4,077.9	$66.8	1.6%	$525.6	na	18.8
1982	3,185.9	24.2	0.8	509.3	na	19.6
1981	3,045.6	65.0	2.1	370.7	na	15.1
1980	2,854.0	80.0	2.8	326.3	na	13.5
Solvay (Belgium)						
1983	$3,887.0	$128.3[k]	3.3%	$155.3	$127.1	44.2
1982	3,891.3	47.6[l]	1.2	153.8	131.1	45.4
1981	4,239.7	(9.9)[d,m]	—	247.6	143.4	48.2
1980	4,734.9	79.9[n]	1.7	368.0	154.0	49.1
Hoffmann-La Roche (Switzerland)						
1983	$3,576.2	$156.4	4.4%	$216.1	$473.5	45.9
1982	3,499.2	138.5	4.0	346.7	453.5	46.5
1981	3,456.4	129.1	3.7	308.6	414.2	44.0
1980	3,506.5	138.9	4.0	309.0	415.0	43.6
Sandoz (Switzerland)						
1983	$3,117.1	$152.4	4.9%	$128.6	$261.9	38.1
1982	2,981.8	134.5	4.5	124.6	244.8	37.3
1981	2,941.8	115.8	3.9	155.6	236.2	36.4
1980	2,934.1	121.0	4.1	153.9	248.5	35.5
BOC International (U.K.)						
1983	$2,582.1	$ 83.2[o]	3.2%	$468.1	na	39.1
1982	2,686.9	113.0[p]	4.2	388.3	na	38.4
1981	3,086.6	93.9[q]	3.0	316.0	na	42.1
1980	2,777.9	92.6[r]	3.3	319.3	na	44.7
Albright & Wilson (U.K.)						
1983	$ 865.3	$31.9[s]	3.7%	$37.2	na	6.3
1982	929.6	12.4[t]	1.3	33.6	na	7.2
1981	1,019.9	9.3[u]	0.9	51.7	na	8.9
1980	986.0	(5.1)[d,v]	—	70.5	na	9.2
UCB (Belgium)						
1983	$572.4	$22.0[w]	3.8%	$23.5	$17.6	6.4
1982	606.6	9.4	1.6	20.0	17.2	6.7
1981	686.0	4.3	0.6	31.0	18.7	7.8
1980	786.4	8.1	1.0	38.2	21.9	8.1
Fisons (U.K.)						
1983	$ 554.5	$38.1[x]	6.9%	$4.7	$21.2	5.8
1982	613.8	25.4	4.1	3.2	29.4	7.5
1981	1,002.8	7.8	0.8	3.9	31.2	9.8
1980	1,055.1	(3.3)[d]	—	4.9	32.6	11.3
Laporte Industries (U.K.)						
1983	$440.4	$27.7[y]	6.3%	$ 7.7	na	3.5
1982	425.5	19.3[z]	4.6	21.7	na	3.5
1981	435.5	12.8	2.9	20.3	na	3.9
1980	457.0	7.4	1.6	37.2	na	4.7

a Excludes nonrecurring net loss of $28.8 million. b Excludes nonrecurring net loss of $12.2 million. c Excludes nonrecurring net loss of $348.8 million. d Deficit. e Excludes minority interests' loss of $4.6 million. f Excludes nonrecurring loss of $105.7 million and gain from minority interests of $0.7 million. g Excludes nonrecurring net loss of $35.8 million. h Excludes nonrecurring net loss of $18.4 million. i Excludes nonrecurring net gain of $2.8 million. j Excludes nonrecurring net loss of $123.6 million. k Excludes nonrecurring net loss of $25.7 million. l Excludes nonrecurring net gain of $ million. m Excludes nonrecurring net loss of $10.3 million. n Excludes nonrecurring net loss of $11.3 million. o Excludes nonrecurring net loss of $19.4 million. p Excludes nonrecurring net gain of $10.7 million. q Excludes nonrecurring net gain of $1.2 million. r Excludes nonrecurring net loss of $24.7 million. s Excludes nonrecurring net gain of $1.5 million. t Excludes nonrecurring net loss of $17.2 million. u Excludes nonrecurring net gain of $1.8 million. v Excludes nonrecurring net loss of $7.9 million. w Excludes nonrecurring net loss of $3.0 million. x Excludes nonrecurring net loss of $10.0 million. y Excludes nonrecurring net loss of $3.5 million. z Excludes nonrecurring net gain of $138.4 million. na = not available.

NOTE ON CURRENCY CONVERSION

For monetary statistics in this section, European currencies were converted to U.S. dollars by the following conversion rates:

	$1.00 (U.S.) is equivalent to:									
	Belgium	France	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.	West Germany
1983	51.13 francs	7.62 francs	1519 lire	2.85 guilders	7.30 crowns	143.43 pesetas	7.67 crowns	2.10 francs	0.659 pound	2.55 marks
1982	45.69 francs	6.57 francs	1353 lire	2.67 guilders	6.45 crowns	109.86 pesetas	6.28 crowns	2.03 francs	0.571 pound	2.43 marks
1981	37.13 francs	5.44 francs	1137 lire	2.50 guilders	5.74 crowns	92.31 pesetas	5.06 crowns	1.96 francs	0.493 pound	2.26 marks
1980	29.24 francs	4.23 francs	856 lire	1.99 guilders	4.94 crowns	71.71 pesetas	4.23 crowns	1.67 francs	0.430 pound	1.82 marks
1979	29.32 francs	4.25 francs	831 lire	2.01 guilders	5.06 crowns	67.12 pesetas	4.29 crowns	1.66 francs	0.471 pound	1.83 marks

6 Foreign Chemical Industries-Japan

Japanese chemical firms are not yet completely healthy, but they are no longer candidates for an intensive care unit. The long-awaited economic recovery finally has arrived and, with it, chemical company fortunes are looking up. Domestic demand has increased, so that companies now are able to push through price increases and make them stick. Exports once more are increasing, and competition from imports has eased.

All of this means higher profits for Japan's troubled chemical companies, which seem to have been hit harder by the 1979 oil crisis than they were by the crisis in 1973. To be sure, profit margins still are low, but there isn't so much red ink now as there was previously.

Output of most chemicals is increasing. One indicator: Ethylene production last year increased almost 3% after three successive years of decline.

WORLD TRADE: Chemical deficit continues

$ Millions	1983	1982	1981	1980
Total exports	$146,927	$138,831	$152,030	$129,807
Total imports	126,393	131,931	143,290	140,528
Chemical exports	6,983	6,365	6,841	6,767
Chemical imports	7,207	6,824	6,487	6,202

Source: Ministry of International Trade & Industry

INDUSTRY TRENDS: Modest gain in 1983

Index, 1980 = 100	1983	1982	1981	Change 1982-83
All chemicals				
Production	108.8	102.5	99.8	6%
Shipments	104.6	98.9	98.0	6
Inventories	92.3	98.1	99.7	−6
Petrochemicals				
Production	98.5	92.4	94.5	7
Shipments	97.9	92.7	95.0	6
Inventories	86.7	94.1	93.8	−8
Plastics				
Production	105.2	96.5	95.4	9
Shipments	104.5	96.1	95.7	9
Inventories	88.9	90.9	95.6	−2
Synthetic fibers				
Production	97.1	96.0	97.9	1
Shipments	98.6	97.0	100.0	2
Inventories	126.6	121.5	105.6	4
Synthetic rubber				
Production	91.6	85.1	92.3	8
Shipments	91.9	85.8	93.1	7
Inventories	80.9	91.4	94.8	−11
Fertilizer				
Production	77.4	80.2	84.6	−3
Shipments	78.0	82.2	84.5	−5
Inventories	72.3	85.5	104.5	−15
Al. manufacturing				
Production	104.9	101.4	101.0	3
Shipments	103.4	99.9	100.6	3
Inventories	96.3	101.5	102.1	−5

Source: Ministry of International Trade & Industry

PRODUCTION: Generally higher last year

Thousands of metric tons unless otherwise indicated	1983	1982	1981	1980	Change 1982-83
ORGANIC CHEMICALS					
Acetaldehyde	255	279	324	432	−9%
Acetic acid	328	353	365	418	−7
Acetone	247	229	225	235	8
Acrylonitrile	459	489	477	469	−6
Benzene	1750	1588	1690	1847	10
Butadiene	556	522	518	574	7
Butyl alcohol	229	228	237	222	0
Caprolactam	395	388	427	443	2
Cyclohexane	454	426	475	500	7
Dioctylphthalate	231	221	223	241	5
Ethylene	3684	3590	3655	4176	3
Ethylene dichloride	1736	1548	1650	2060	12
Ethylene glycol	357	385	411	492	−7
Ethylene oxide	468	471	478	529	−1
Methanol, refined	373	625	734	836	−40
Octyl alcohol, synthetic	219	226	239	241	−3
Phenol, synthetic	271	211	214	215	28
Phthalic anhydride[a]	161	159	164	142	1
Propylene	2632	2565	2538	2636	3
Propylene glycol	194	185	171	163	5
Styrene	1184	1086	1095	1114	9
Terephthalic acid	702	649	635	601	8
Toluene	831	803	821	885	3
Toluene diisocyanate	74	67	64	67	10
Urea	980	1187	1483	1770	−17
Xylene	1264	1225	1202	1195	3
INORGANIC CHEMICALS					
Ammonium chloride	435	486	584	683	−10
Ammonium sulfate	1722	1689	1817	1879	2
Calcium carbide	476	483	495	550	−1
Calcium superphosphate	559	527	483	591	6
Carbon black	568	504	557	575	13
Chlorine, liquid	818	794	764	763	3
Hydrochloric acid	511	551	565	570	−7
Nitrogen, millions of cu m	5369	5236	5147	4586	3
Oxygen, millions of cu m	6434	6493	6603	6854	−1
Sodium carbonate	1103	1162	1178	1357	−5
Sodium hydroxide	2863	2792	2872	3159	3
Sodium silicate	588	650	692	712	−10
Sulfuric acid	6662	6530	6572	6777	2
Titanium dioxide	196	184	176	173	7
PLASTICS					
Phenolic resins	303	281	294	304	8
Polyethylene	1773	1674	1671	1860	6
Polypropylene	1062	941	959	927	13
Polystyrene	1311	1190	1183	1129	10
Polyvinyl chloride	1420	1218	1129	1429	17
DYES, synthetic	55	54	50	51	2
RUBBER CHEMICALS, organic	42	39	43	46	8
RUBBER, synthetic	1002	931	1010	1094	8

a Petroleum-based only. **Source:** Ministry of International Trade & Industry

COMPANY RESULTS: **Higher sales help to bolster profits**

$ Millions	Sales	Net income	Profit margin	Total assets	Employees (thousands)
Mitsubishi Chemical Industries[a]					
1983	$3127	0.0	—	$3479	8.5
1982	3142	($36.5)[b]	—	3326	8.4
1981	3399	13.5	0.4%	3374	8.3
1980	3730	39.8	1.1	3739	8.0
Asahi Chemical Industry					
1983	$2958	$46.5	1.6%	$3023	16.3
1982	2670	45.8	1.7	2809	14.0
1981	2663	48.4	1.8	2895	13.6
1980	2800	64.4	2.3	2825	13.6
Sumitomo Chemical[c]					
1983	$2746	0.0	—	$2775	7.9
1982	2681	($30.6)[b]	—	2510	9.1
1981	2881	10.5	0.4%	2699	9.6
1980	3167	45.0	1.4	2856	9.7
Toray Industries					
1983	$2577	$59.2	2.3%	$2576	14.1
1982	2398	59.4	2.5	2385	13.9
1981	2503	48.3	1.9	2446	13.9
1980	2494	57.9	2.3	2408	13.8
Teijin					
1983	$1817	$48.6	2.7%	$1846	7.1
1982	1751	30.1	1.7	1953	7.1
1981	2072	24.1	1.2	2090	7.2
1980	2111	28.3	1.3	2093	7.3
Dainippon Ink & Chemicals					
1983	$1707	$19.0	1.1%	$1472	6.0
1982	1609	17.9	1.1	1426	5.9
1981	1657	18.8	1.1	1511	5.9
1980	1654	22.1	1.3	1448	5.8
Mitsui Toatsu Chemicals					
1983	$1606	($29.6)[b]	—	$1794	5.4
1982	1783	44.9	2.5%	1790	5.7
1981	1948	(22.3)[b]	—	1858	7.4
1980	1965	(32.8)[b]	—	1941	7.7
Mitsubishi Petrochemical[c]					
1983	$1521	0.0	—	$1644	2.5
1982	1508	($37.4)[b]	—	1767	3.5
1981	1667	(6.3)[b]	—	1802	3.9
1980	1900	16.2	0.9%	1908	3.8
Showa Denko[c]					
1983	$1479	($12.7)[b]	—	$2086	5.0
1982	1539	(2.9)[b]	—	2004	5.3
1981	1729	2.6	0.2%	2102	5.4
1980	2083	35.7	1.7	2276	5.5
Sekisui Chemical					
1983	$1373	$15.2	1.1%	$1199	6.1
1982	1294	9.0	0.7	1238	6.2
1981	1338	7.9	0.6	1322	6.1
1980	1420	17.0	1.2	1359	6.1
Unitika					
1983	$1206	0.0	—	$1146	6.4
1982	1045	($18.6)[b]	—	1113	6.2
1981	965	0.4	0.0%	1135	6.2
1980	1011	4.1	0.4	1229	6.3
Mitsui Petrochemical Industries					
1983	$1166	$ 6.3	0.5%	$1392	4.3
1982	1200	(7.1)[b]	—	1412	4.5
1981	1260	(8.6)[b]	—	1455	4.6
1980	1339	10.8	0.8	1474	4.6

$ Millions	Sales	Net income	Profit margin	Total assets	Employees (thousands)
Toyo Soda Mfg.					
1983	$930	$ 16.9	1.8%	$1133	3.9
1982	883	(10.7)[b]	—	1131	4.3
1981	927	(60.4)[b]	—	1209	4.9
1980	942	5.2	0.6	1251	5.0
Mitsubishi Gas Chemical					
1983	$923	$11.4	1.2%	$891	3.8
1982	909	9.9	1.1	884	3.8
1981	931	20.8	2.2	938	3.8
1980	898	30.7	3.4	948	3.8
Kyowa Hakko Kogyo[c]					
1983	$921	$21.5	2.3%	$836	5.1
1982	915	21.0	2.3	802	5.0
1981	928	18.8	2.0	782	4.9
1980	945	14.9	1.6	749	5.0
Mitsubishi Rayon					
1983	$908	$13.5	1.5%	$884	3.7
1982	841	9.9	1.2	824	3.6
1981	894	11.0	1.2	803	3.5
1980	882	11.1	1.3	814	3.5
Kuraray					
1983	$862	$5.1	0.6%	$943	6.4
1982	821	4.3	0.5	904	6.3
1981	879	8.2	0.9	928	6.3
1980	956	7.5	0.8	984	5.7
Hitachi Chemical					
1983	$824	$11.0	1.3%	$489	4.5
1982	751	8.5	1.1	465	4.4
1981	753	9.9	1.3	451	4.3
1980	746	8.2	1.1	440	4.3
Kanegafuchi Chemical Industry					
1983	$773	$13.1	1.7%	$597	2.9
1982	673	8.3	1.2	546	3.3
1981	719	5.9	0.8	583	3.2
1980	776	13.3	1.7	612	3.1
Japan Synthetic Rubber					
1983	$761	$9.7	1.3%	$678	2.7
1982	699	7.5	1.1	709	2.7
1981	737	3.0	0.4	720	2.7
1980	779	8.2	1.1	761	2.6
Shin Etsu Chemical[d]					
1983	$756	$20.3	2.7%	$609	2.5
1982	668	18.4	2.8	601	2.5
1981	674	8.5	1.3	629	2.4
1980	653	11.5	1.8	600	2.3
Tokuyama Soda					
1983	$718	$6.8	0.9%	$691	2.4
1982	695	5.5	0.8	669	2.5
1981	768	4.4	0.6	691	2.5
1980	767	5.2	0.7	682	2.4
Daicel Chemical					
1983	$697	$14.8	2.1%	$643	3.1
1982	654	12.9	2.0	634	3.1
1981	702	12.5	1.8	656	3.1
1980	677	12.6	1.9	659	3.1

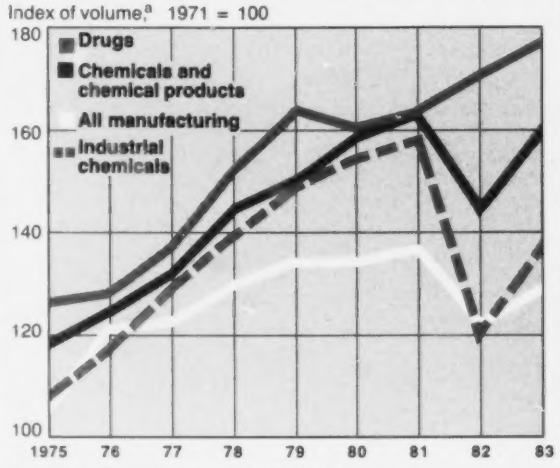
a Fiscal year ends Jan. 31. b Deficit. c Fiscal year ends Dec. 31. d Fiscal year ends May 31. **Note:** Fiscal years end March 31 for each year unless otherwise indicated. Fiscal year 1983 data are estimates. **Results** are converted from yen to U.S. dollars on the following basis: Fiscal year 1983: $1.00 = 236.7 Y; fiscal year 1982: $1.00 = 235.8 Y; fiscal year 1981: $1.00 = 222.4 Y; fiscal year 1980: $1.00 = 212.9 Y. Year-to-year changes in sales, net income, and assets are affected by fluctuations in the currency exchange rate. **Source:** Toyo Keizai Shinposha

6 Foreign Chemical Industries–Canada

Canadian chemical companies have recovered nicely from the sinkhole year of 1982, when sizable losses were the rule. Last year, higher sales turned 1982's red ink into black ink. Stronger demand, triggered by an improved economy at home and in the U.S., which is Canada's largest chemical export market, pushed up production of most chemicals and allowed higher plant operating rates.

But Canadian chemical companies aren't out of the woods yet. Case in point: The industry's chemical trade balance slipped back into deficit as imports surged while exports staged only a modest recovery. This indicates that Canadian chemical companies aren't so competitive as they would like to be. For this, they blame the country's energy policies, which have pushed petrochemical feedstock prices upward while they have been going down elsewhere. The industry is pressing for a new government pricing policy.

Chemical output up, but not to 1981 peak



a Gross domestic product. **Source:** Statistics Canada

COMPANY RESULTS: A return to profitability

$ Millions (Canadian)	Sales	Net income[a]	Profit margin	Capital expenditures	Employees (thousands)
C-I-L Inc.[b]					
1983	$1113.8	$23.9	2.1%	$109.0	6.7
1982	1059.8	15.2	1.4	85.5	6.9
1981	1149.9	54.3	4.7	94.1	7.8
1980	1004.2	51.5	5.1	70.2	8.3
Celanese Canada					
1983	$398.4	$ 9.0	2.3%	$12.3	3.4
1982	323.9	(5.6)[b]	—	59.8	3.4
1981	373.0	20.4	5.4%	87.7	3.5
1980	336.2	24.2	7.2	55.1	4.2
Du Pont Canada					
1983	$1116.0	$35.0	3.1%	$25.2	5.0
1982	980.0	(7.4)[b]	—	24.0	5.4
1981	1139.1	33.5	2.9%	47.0	6.1
1980	995.3	42.6	4.3	53.2	5.9
Polysar					
1983	$1336.9	$ 8.7	0.7%	$144.2	6.0
1982	1330.0	(30.5)[b]	—	207.0	6.6
1981	1049.0	74.0	7.1%	58.3	5.4
1980	1171.0	73.4	6.3	86.2	6.1
Union Carbide Canada					
1983	$687.0	($1.4)[b]	—	$ 55.9	4.2
1982	691.3	(17.9)[b]	—	67.6[c]	4.5
1981	827.3	36.1	4.4%	100.0	5.0
1980	794.8	79.6	10.0	58.9	5.0

a Excluding extraordinary gains and losses. b Deficit. c Excludes $50.9 million spent on Prentiss, Alta., ethylene glycol plant that was transferred to another Union Carbide subsidiary

PRODUCTION: Several chemicals rebound

Thousands of metric tons	1983	1982	1981	Change 1982–83
ORGANIC CHEMICALS				
Benzene	580	519	571	12%
Butadiene	133	118	126	13
Butylene	138	107	124	29
Ethylene	1196	1013	1330	18
Formaldehyde	90	70	85	29
Methanol	1670	na	na	—
Propanol	63	67	73	−6
Propylene	715	693	671	3
Toluene	411	471	480	−13
Urea	1445	1231	1303	17
Xylene	432	431	409	0
INORGANIC CHEMICALS				
Ammonia, anhydrous 100%	2888	2509	2654	15
Ammonium nitrate	934	1018	1212	−8
Ammonium phosphate	1259	1027	1355	23
Chlorine	1385	1233	1292	12
Hydrochloric acid	170	143	186	19
Nitric acid	855	977	1158	−12
Phosphoric acid, 100% P_2O_5	656	553	744	19
Sodium chlorate	294	264	255	11
Sodium hydroxide	1528	1367	1458	12
Sulfuric acid	3686	3131	4117	18
SYNTHETIC RESINS				
Polyesters, unsaturated	26	27	28	−4
Polyethylene, high density	211	194	222	9
Polyethylene, low density	412	376	410	10
Polyvinyl chloride	243	193	222	26

na = not available. **Source:** Statistics Canada

SHIPMENTS: Strong upsurge for plastics, drugs, fibers, and paint

$ Millions (Canadian)	1983	1982	1981	1980	Change 1982–83
All manufacturing	$199,991	$183,803	$191,114	$168,365	9%
Chemicals and chemical products	14,446	12,885	13,190	11,218	12
Industrial chemicals, inorganic	2,373	2,287	2,191	1,856	4
Industrial chemicals, organic	3,184	2,804	3,212	2,643	14
Plastics and synthetic resins	1,517	1,298	1,512	1,372	17
Pharmaceuticals and medicinals	1,816	1,572	1,327	1,144	16
Fertilizers, mixed	218	200	211	189	9
Paint and varnish	1,001	835	880	747	20
Soap and cleaning compounds	1,176	1,049	1,020	866	12
Toilet preparations	692	607	588	504	14
Pigments and dry colors	289	258	250	221	12
Printing ink	205	193	189	169	6
Miscellaneous chemical products	1,974	1,782	1,810	1,508	11
Man-made fibers	1,380	1,141	1,404	1,270	21

Source: Statistics Canada

CHEMICAL IMPORTS: Sharp growth last year

$ Millions (Canadian)[a]	1983	1982	1981	Change 1982–83
Inorganic chemicals	$ 411	$ 370	$ 399	11%
Organic chemicals	1265	1019	1090	24
Fertilizers and fertilizer materials	185	143	157	29
Synthetic and reclaimed rubber	161	142	160	13
Plastics materials	751	549	607	37
Plastic film and sheet	268	208	243	29
Other plastic shapes and forms	182	137	154	33
Dyes, except dyeing intermediates	77	63	76	22
Pigments, lakes, and toners	81	52	65	56
Paints and related products	111	85	98	31
Other chemical products	903	817	765	11
TOTAL	**$4393**	**$3584**	**$3814**	**23%**
Imports from U.S.	**$3425**	**$2796**	**$3011**	**22%**
U.S. share, %	**65%**	**63%**	**61%**	—

Source: Statistics Canada

CHEMICAL EXPORTS: Modest recovery

$ Millions (Canadian)[a]	1983	1982	1981	Change 1982–83
Chemical elements	$ 187	$ 170	$ 147	10%
Other inorganic chemicals	784	827	1064	−5
Organic chemicals	1201	1099	1183	9
Fertilizers and fertilizer materials	1168	1059	1343	10
Synthetic rubber and plastic materials	521	516	513	1
Plastics, basic shapes and forms	198	173	149	14
Other chemical products	284	229	206	24
TOTAL	**$4345**	**$4073**	**$4605**	**7%**
Exports to U.S.	**$2843**	**$2528**	**$2826**	**12%**
U.S. share, %	**65%**	**63%**	**61%**	—

a Domestic exports only. **Source:** Statistics Canada

TRADE BALANCE: Total surplus narrows

$ Millions (Canadian)	1983	1982	1981	1980
Total exports	$88,426	$81,829	$81,337	$74,446
Total imports	75,694	67,926	79,482	69,274
Trade balance	12,732	13,903	1,855	5,172

Import surge wipes out chemical trade surplus

Chemical exports	$ 4,345	$ 4,073	$ 4,605	$ 4,056
Chemical imports	4,393	3,584	3,814	3,354
Chemical trade balance	−48	489	791	702

Source: Statistics Canada

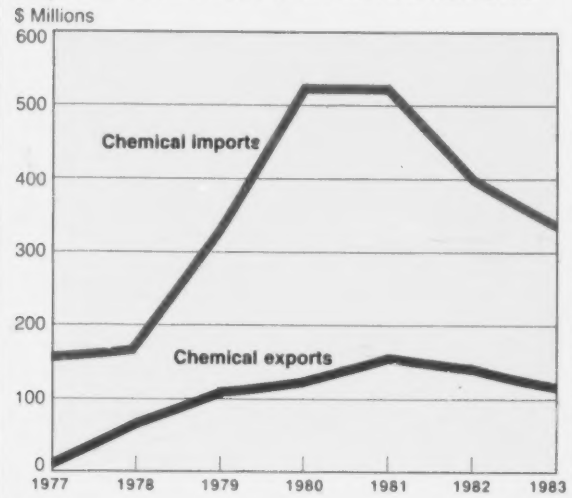
PRICES: Chemicals show a moderate rise

Industry selling price indexes, 1971 = 100	Annual average 1983	1982	1981	Change 1982–83
All manufacturing	298.7	288.8	272.4	3%
Chemicals and chemical products	316.6	306.9	286.4	3
Industrial chemicals—inorganic	341.4	337.5	313.9	1
Ammonium nitrate[a]	208.9	221.5	212.2	−6
Chlorine	360.2	315.5	275.2	14
Oxygen	237.7	224.0	215.5	6
Sodium hydroxide	467.1	450.1	383.8	4
Industrial chemicals—organic	439.2	429.7	410.3	2
Plastics and synthetic resins	314.3	297.7	294.6	6
Alkyds	211.7	209.0	196.5	1
Phenol-formaldehyde	354.0	344.5	337.4	3
Polyethylene	309.9	290.2	326.9	7
Fertilizers, mixed	284.2	294.5	289.5	−3
Pharmaceuticals and medicinals	233.6	211.9	189.8	10
Paint and varnish	304.3	300.0	283.0	1
Pesticides	332.7	316.6	287.3	5
Synthetic fibers	242.7	254.9	251.9	−5
Petroleum refineries	685.2	643.7	559.8	6
Benzene	446.3	427.4	488.4	4
Toluene	606.0	620.4	592.4	−2
Xylene	544.6	558.0	521.3	−2

a Fertilizer grade. **Source:** Statistics Canada

6 Foreign Chemical Industries-Mexico

Exports decline but trade deficit narrows



Note: Trade in primary petrochemicals only; does not include secondary chemicals
Source: Petróleos Mexicanos

DOMESTIC SALES: Some big increases

Thousands of metric tons[a]	1983	1982	1981	1980	Change 1982–83
Acetaldehyde	199.9	156.2	123.7	100.9	28%
Acrylonitrile	85.9	71.4	74.2	67.9	20
Ammonia, anhydrous	1454.9	1338.1	1204.8	966.8	9
Benzene	11.0	12.8	12.2	12.6	−14
Butadiene	84.1	65.9	69.5	66.1	28
Cyclohexane	51.3	50.5	52.6	52.8	2
Dodecylbenzene	106.9	111.3	92.5	90.1	−4
Ethylene oxide	105.4	77.6	77.9	70.5	36
Hexane	47.0	54.2	51.0	46.1	−13
Isopropyl alcohol	53.6	47.4	32.4	27.8	13
Methanol	139.8	129.0	125.2	97.8	8
Polyethylene, high density	120.3	120.3	100.1	79.5	0
Polyethylene, low density	250.9	261.3	257.5	224.3	−4
Styrene	116.3	117.6	116.9	101.2	−1
Sulfur	319.2	365.2	427.5	408.0	−13
Toluene	81.1	86.5	88.4	81.3	−6
Vinyl chloride	205.6	138.7	144.7	148.1	48
o-Xylene	33.3	26.9	27.0	30.7	24
p-Xylene	131.3	186.9	186.8	116.4	−30

a Domestic sales by Petróleos Mexicanos (Pemex) of primary petrochemicals. Source: Pemex

CHEMICAL IMPORTS: Local output cuts some

Thousands of metric tons[a]	1983	1982	1981	1980	Change 1982–83
Acetaldehyde	42.3	12.9	5.9	58.2	228%
Acrylonitrile	28.5	16.8	19.7	8.6	70
Benzene	0.0	12.2	21.0	14.5	—
Butadiene	45.0	49.6	55.0	54.8	−9
Cyclohexane	2.6	13.0	7.9	10.1	−80
Dichloroethane	24.7	0.0	1.7	14.3	—
Dodecylbenzene	51.3	47.4	32.8	41.3	8
Ethylbenzene	5.8	15.9	10.8	10.0	−64
Ethylene	0.0	31.4	15.1	0.0	—
Ethylene oxide	0.0	0.0	31.1	34.4	—
Isopropyl alcohol	24.9	31.1	15.1	18.0	−20
Perchloroethylene	9.0	11.6	16.7	5.5	−22
Polyethylene, high density	49.2	17.1	10.2	26.0	24
Polyethylene, low density	88.0	105.7	125.9	104.0	−17
Propylene	17.1	22.1	24.3	20.3	−23
Propylene tetramer	5.8	15.2	23.1	14.5	−62
Styrene	65.6	60.9	87.8	76.7	8
Toluene	0.0	11.8	22.8	36.7	—
o-Xylene	6.8	9.8	12.1	13.3	−31
p-Xylene	24.5	130 6	148.0	94.5	−81

a Imports by Petróleos Mexicanos (Pemex) of primary petrochemicals. Source: Pemex

PRODUCTION: New capacity spurs gains

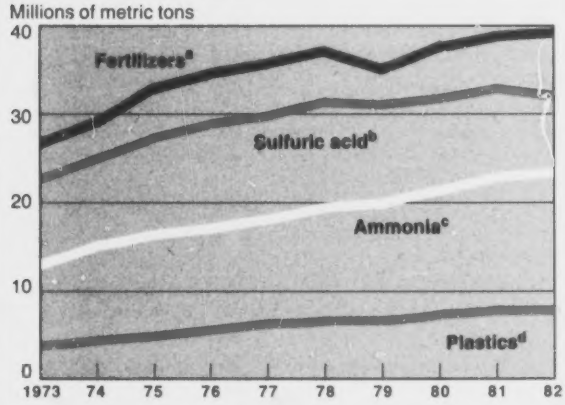
Thousands of metric tons[a]	1983	1982	1981	1980	Change 1982–83
Acetaldehyde	152.9	149.1	122.2	47.6	3%
Acrylonitrile	55.3	52.7	54.0	54.3	5
Ammonia, anhydrous	2354.6	2469.3	2183.2	1883.2	−5
Benzene	138.8	96.0	76.5	79.3	45
Butadiene	18.5	14.6	12.3	17.0	27
Cyclohexane	48.5	34.9	44.1	39.7	40
Cumene	36.6	20.4	1.6	0.0	79
Dichloroethane	265.2	201.1	116.9	106.3	32
Dodecylbenzene	56.6	61.8	59.5	55.4	−8
Ethane	1637.9	1550.3	1337.4	632.2	6
Ethylbenzene	24.2	23.0	29.1	29.3	5
Ethylene	645.1	395.8	378.3	365.5	63
Ethylene oxide	112.0	79.0	48.5	29.7	42
Hexane	64.4	75.8	65.6	60.1	−15
Hydrochloric acid	78.9	46.7	33.2	36.1	69
Isopropyl alcohol	11.9	10.9	15.6	12.6	9
Methanol	205.6	191.3	179.7	173.6	7
Nitrogen	45.0	39.0	29.5	0.0	15
Oxygen	213.6	208.4	159.1	0.0	2
Polyethylene, high density	82.2	78.2	78 1	66.9	5
Polyethylene, low density	88.3	93.3	91.2	91.4	−5
Propylene	190.7	157.6	156.2	136.9	21
Propylene tetramer	29.6	38.5	35.4	35.8	−23
Styrene	24.0	29.0	32.9	31.3	−17
Sulfur, recovered	377.2	424.9	425.5	402.4	−11
Toluene	222.6	138.1	131.6	124.9	61
Vinyl chloride	134.4	79.4	56.9	62.5	69
m- and *p*-Xylene	197.2	99.2	86.6	77.2	99
o-Xylene	38.6	15.8	16.7	16.1	144

a Production of primary petrochemicals by Petróleos Mexicanos (Pemex). Source: Pemex

The centrally planned economies of East Europe and the Soviet Union turned upwards in 1983, reversing the decelerating trend in industrial growth that started in the late 1970s. Industrial output for the region rose 4.2%, surpassing the goal of 3.4%. This almost doubled the slow growth rates of 1982 (2.4%) and 1981 (2.2%), which had fallen far short of five-year-plan targets (4.2% and 4.0%, respectively). Growth was spurred particularly by recovery in Poland (output up 6.7%).

Most nations of the region stepped up chemical production as well, with several registering higher growth rates for output of chemicals and rubber than for industry as a whole. Bulgaria led, with chemicals up 7.4% versus 4.6% for all industry. In the U.S.S.R., chemical output was up 6% compared to 4% for all industry, and in Romania it was up 5.8% versus 4.8% for all industry. Among key chemicals, the Soviets raised production of mineral fertilizers 11.1%, plastics 8.5%, and pesticides 4.5%.

Growth slows for several important chemical products



a As N, P_2O_5, and K_2O. b 100% H_2SO_4. c Nitrogen content. d Including resins for man-made fibers in U.S.S.R. **Note:** Data for U.S.S.R., Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania. **Sources:** Central Intelligence Agency, Department of Agriculture, C&EN estimates

MAN-MADE FIBERS: U.S.S.R. makes more than half produced in eastern bloc

Production, thousands of metric tons	1983	1982	1981	1980	Change 1982–83
Bulgaria	101	105	101	96	−4%
Czechoslovakia	186	180	169	165	3
East Germany	na	301	303	293	—
Hungary	27	28	29	29	−4
Poland	232	201	205	256	15
Romania	171	156	145	152	10
U.S.S.R.	1400	1235	1213	1176	13
TOTAL	**na**	**2206**	**2165**	**2167**	—

na = not available. **Source:** United Nations Economic Commission for Europe

PRODUCTION GROWTH: 1983 brings pickup

% annual change in gross output	1983	1982	1981	1980	1979
U.S.S.R. and East Europe					
All industry	4.2%	2.4%	2.2%	3.4%	3.7%
Bulgaria					
All industry	4.6	4.6	4.8	4.2	5.5
Chemicals and rubber	7.4	6.4	4.2	11.1	9.1
Czechoslovakia					
All industry	2.7	1.1	2.1	3.5	3.7
Chemicals and rubber	2.7	1.4	1.7	4.8	3.3
East Germany					
All industry[a]	4.1	3.2	4.7	4.7	4.6
Chemicals and rubber	na	4.0	3.7	3.3	4.0
Hungary					
All industry	1.0	2.5	2.8	−2.0	3.0
Chemicals and rubber	1.6[b]	1.9	3.1	−2.1	6.1
Poland					
All industry	6.7	−2.1	−10.8	0.0	2.7
Chemicals and rubber	na	0.1	−11.4	0.4	2.3
Romania					
All industry	4.8	1.1	2.6	6.5	8.1
Chemicals and rubber	5.8	1.4	3.9	6.8	1.4
U.S.S.R.					
All industry[c]	4.0	2.9	3.4	3.6	3.4
Chemicals and rubber[c]	6.0	3.0	5.9	5.6	2.3
All industry[d]	na	2.2[e]	2.5	2.8	2.1
Chemicals and rubber[d]	na	1.6[e]	4.0	4.7	−0.2

a Industrial commodity production. b For socialist industry only. c Figures based on official Soviet statistics. d Figures based on Central Intelligence Agency estimates, giving lower results because of postulated upward bias in official figures. e Preliminary figure. **na** = not available. **Sources:** United Nations Economic Commission for Europe, based on official national statistics, Central Intelligence Agency

AGRICULTURAL CHEMICALS: Little growth in fertilizer supply except in Soviet Union

Thousands of metric tons	1983[a]	1982	1981	1980	1979
Bulgaria					
Fertilizer supply[b]	1,031	1,038	1,044	830	820
Pesticide supply[c]	na	40.4	48.7	40.0	34.8
Czechoslovakia					
Fertilizer supply[b]	na	1,741	1,720	1,730	1,745
East Germany					
Fertilizer supply[b]	1,385	1,408	1,726	1,637	1,713
Pesticide supply[c]	na	26.7	27.0	27.0	26.7
Hungary					
Fertilizer supply[b]	1,530	1,528	1,485	1,399	1,502
Poland					
Fertilizer supply[b]	na	3,346	3,499	3,635	3,567
Pesticide supply[d]	47.3	52.4	38.4	29.3	44.4
Romania					
Fertilizer supply[b]	na	1,114	1,618	1,185	1,431
U.S.S.R.					
Fertilizer supply[b]	23,000	20,152	19,176	18,763	17,335
Pesticide supply[d]	557	533	504	471	475

a Preliminary figures. b Nutrient content. c On basis of active substance. d On conventional weight basis. **na** = not available. **Sources:** United Nations Economic Commission for Europe, based on official national statistics; Department of Agriculture

PRODUCTION: Soviet Union posted stronger growth last year than in 1982

Thousands of metric tons, unless otherwise noted	1983[a]	1982	1981	1980	1979
U.S.S.R.					
Sulfuric acid, 100%	24,700	23,800	24,095	23,033	22,364
Mineral fertilizers[b]	29,700	26,738	25,998	24,767	22,137
Nitrogen[b]	13,095	11,593	10,705	10,241	9,151
Phosphate[b,c]	7,315	7,057	6,836	6,455	6,344
Potassium[b]	9,280	8,079	8,449	8,064	6,635
Synthetic ammonia[d]	na	15,400	14,718	13,762	12,278
Plastics[e]	4,400	4,057	4,089	3,637	3,478
Sodium hydroxide, 100%	2,900	2,783	2,757	2,755	2,680
Synthetic rubber[f]	na	1,815	1,860	1,880	1,867
Rubber tires[g] (thousands of units)	62,000	61,700	60,500	60,100	59,981
Pesticides	557	533	504	470	475
BULGARIA					
Sulfuric acid, 100%	na	892	920	852	998
Mineral fertilizers[b]	na	999	1,011	947	959
Nitrogen[b]	na	760	753	730	677
Phosphate[b]	na	239	258	217	282
Synthetic ammonia[d]	na	na	1,023	1,009	951
Plastics	na	325	290	255	200
Sodium hydroxide, 100%	na	155	151	162	107
Synthetic rubber	na	30	30	30	30
Rubber tires[g] (thousands of units)	na	na	2,230	2,117	1,793
CZECHOSLOVAKIA					
Sulfuric acid, 100%	na	1,252	1,318	1,284	1,253
Mineral fertilizers[b]	na	na	1,085	1,182	1,147
Nitrogen[b]	na	567	539	618	591
Phosphate[b,c]	na	335	340	361	357
Potassium[b,h]	na	na	206	203	199
Synthetic ammonia[d]	na	na	na	841	804
Plastics	1,006	956	913	894	853
Sodium hydroxide, 100%	na	315	330	325	312
Synthetic rubber	na	65	63	60	59
Rubber tires[g] (thousands of units)	na	na	6,844	6,740	6,581
EAST GERMANY					
Sulfuric acid, 100%	na	920	948	958	952
Mineral fertilizers[b]	na	4,668	4,787	4,735	4,681
Nitrogen[b]	na	948	967	943	875
Phosphate[b,c]	na	286	360	370	411
Potassium[b]	na	3,434	3,460	3,422	3,395
Synthetic ammonia[d]	na	na	1,403	1,159	1,079
Plastics	na	990	998	861	779
Sodium hydroxide, 100%	na	695	631	626	548
Synthetic rubber	na	155	155	150	150
Rubber tires[g] (thousands of units)	na	7,056	7,026	7,067	6,890
HUNGARY					
Sulfuric acid, 100%	na	600	546	608	603
Mineral fertilizers[b]	na	na	899	847	858
Nitrogen[b]	na	571	589	559	550
Phosphate[b]	na	155	158	149	165
Potassium[b,h]	na	na	152	139	143
Synthetic ammonia[d]	na	na	819	795	803
Plastics	345	326	314	328	294
Sodium hydroxide, 100%[f]	na	178	180	188	194
Rubber tires[g] (thousands of units)	na	na	838	840	750
POLAND					
Sulfuric acid, 100%	na	2,682	2,776	3,019	2,983
Mineral fertilizers[b]	2,324	2,283	2,242	2,238	2,431
Nitrogen[b]	na	1,297	1,274	1,290	1,376
Phosphate[b]	na	868	866	843	931
Potassium[b,h]	na	118	102	105	124
Synthetic ammonia[d]	na	na	1,465	1,483	1,530
Plastics	na	438	476	549	440
Sodium hydroxide, 100%	na	363	400	415	436
Synthetic rubber	na	100	111	118	130
Rubber tires[g] (thousands of units)	na	5,693	na	8,743	8,500
ROMANIA					
Sulfuric acid, 100%	na	1,600	1,814	1,756	1,750
Mineral fertilizers[b]	2,880	2,692	2,641	2,451	2,522
Nitrogen[b]	na	2,008	1,822	1,707	1,738
Phosphate[b]	na	na	717	687	709
Potassium[b,h]	na	na	102	57	75
Synthetic ammonia[d]	na	na	2,383	2,247	2,333
Plastics	na	591	584	579	516
Sodium hydroxide, 100%	na	na	767	723	704
Synthetic rubber	na	160	146	150	149
Rubber tires[g] (thousands of units)	na	na	5,170	5,046	4,691

a Approximate figures. b Nutrient content basis, as N, P_2O_5, or K_2O. c Including production of ground phosphate rock for direct applications and phosphate animal feeds. d Nitrogen content. e Including resins for man-made fibers. f Estimated. g For all motor vehicle tires, excluding aircraft and bicycle tires. h Imported potash added to domestically produced nitrogen and phosphate to form multinutrient fertilizer. i Including regenerated NaOH. **na** = not available. **Sources:** Central Intelligence Agency, Department of Commerce, Department of Agriculture, United Nations Economic Commission for Europe (based on official national statistics)

SOVIET FOREIGN TRADE: Overall trade balance continues to widen

$ Millions	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Exports[a]	$93,685	$87,170	$79,377	$76,437	$64,912	$52,435	$45,227	$37,269	$33,407	$27,374	$21,332
Imports[a]	82,227	77,848	73,158	68,473	57,958	50,798	40,926	38,212	37,070	24,861	20,980
Trade balance	11,458	9,322	6,219	7,964	6,954	1,637	4,301	−943	−3,663	2,513	352
Chemical exports[a]	na	na	2,380	2,139	1,606	1,284	1,063	939	1,027	887	549
Chemical imports[a]	na	na	4,031	3,732	2,803	2,188	1,850	1,668	1,747	1,448	954
Chemical trade balance	na	na	−1,651	−1,593	−1,197	−904	−787	−729	−720	−561	−405

a Free on board. **na** = not available. **Sources:** Central Intelligence Agency, Department of Commerce, based on official Soviet statistics and exchange rates

KOREA

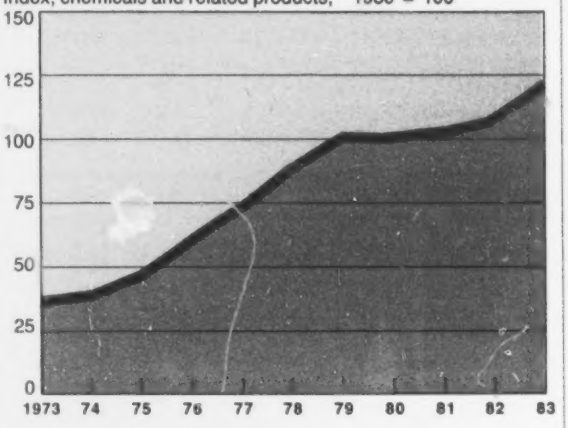
INDUSTRY TRENDS: Output up sharply

Index, 1980 = 100	1983	1982	1981	1980	Change 1982–83
Chemicals, petroleum, coal, rubber, and plastic products					
Production	123.4	105.9	102.5	100.0	17%
Shipments	119.3	102.1	101.6	100.0	17
Inventories	121.1	118.1	115.0	100.0	3
Industrial chemicals					
Production	116.0	101.8	103.7	100.0	14
Shipments	125.1	108.2	105.4	100.0	16
Inventories	114.9	121.1	126.9	100.0	−5
Other chemical products					
Production	143.5	122.4	106.1	100.0	17
Shipments	141.2	119.3	106.7	100.0	18
Inventories	142.5	118.5	94.7	100.0	20
Rubber products					
Production	113.4	98.1	99.4	100.0	16
Shipments	112.0	93.7	95.3	100.0	20
Inventories	107.4	98.2	109.8	100.0	9
Plastic products					
Production	124.2	92.9	91.8	100.0	34
Shipments	123.6	92.6	91.3	100.0	33
Inventories	132.0	121.9	96.5	100.0	8
All manufacturing					
Production	137.6	118.7	113.4	100.0	16
Shipments	134.8	115.5	111.3	100.0	17
Inventories	125.9	126.1	110.1	100.0	0

Source: Korean Bureau of Statistics

Output of chemicals spurts after slow growth during early 1980s

Index, chemicals and related products,[a] 1980 = 100



a Includes petroleum, coal, rubber, and plastic products.
Source: Korean Bureau of Statistics

FOREIGN TRADE: Chemical deficit widens

$ Millions	1983	1982	1981	1980
Exports[a]	$24,445	$21,853	$21,254	$17,505
Imports[b]	26,192	24,251	26,131	22,292
Trade balance	−1,747	−2,398	−4,877	−4,787
Chemical exports	738	740	682	780
Chemical imports	2,281	2,084	2,109	1,836
Chemical trade balance	1,543	−1,344	−1,427	−1,055

a Free on board. b Includes cost, insurance, freight. **Source:** Korean Bureau of Statistics

PRODUCTION: Fertilizers falter

Thousands of metric tons	1983	1982	1981	1980	Change 1982–1983
Sulfuric acid	1610	1596	1304	1702	1%
Complex fertilizers	1614	1667	1211	1439	−3
Ammonia	523	661	908	1031	−21
Urea fertilizers	737	788	1070	973	−6
Ethylene	491	374	374	368	31
Polyethylene	279	218	200	228	28
Polyester fibers	217	189	193	161	15
Insecticides	87	58	54	75	50
Synthetic detergents	57	52	57	64	10

Source: Korean Bureau of Statistics

AUSTRALIA

PRODUCTION: Mostly lower last year

Thousands of metric tons	1983[a]	1982[a]	1981[a]	1980[a]	Change 1982–83
Chemicals and acids					
Hydrochloric acid, 100%	60	55	59	63	10%
Nitric acid, 100%	189	180	182	180	5
Sulfuric acid, 100%	1782	2027	1963	2175	−12
Ammonium sulfate	200	207	211	203	−3
Superphosphate[b]	2986	3568	3770	4202	−16
Plastics and resins	776	800	789	783	−3
Synthetic detergents	209	211	200	202	−1
Unsupported plastics film, sheeting	112	119	125	130	−5
Polyethylene[c]	80	82	84	89	−2
Polyvinyl chloride[d]	17	18	18	17	−9

a Years ending June 30. b Includes double and triple superphosphates and ammonium phosphate expressed in terms of single phosphate (22% P_2O_5 equivalent). c Low and high density. d Including copolymers. **Source:** Australian Bureau of Statistics

FOREIGN TRADE: Import drop brings surplus

$ Millions	1983[a]	1982[a]	1981[a]	1980[a]
Exports[b,c]	$20,733	$20,939	$22,314	$21,079
Imports[d]	20,515	24,608	22,068	18,116
Trade balance	218	−3,669	246	2,963
Chemical exports[b,c]	438	430	487	424
Medicinal products	109	95	95	78
Chemical imports[d]	1,668	1,955	1,842	1,764
Organic chemicals	439	530	509	543
Chemical trade balance	−1,230	−1,525	−1,355	−1,340

a Years ending June 30. b Free on board. c Includes re-exports. d Values for customs purposes, free-on-board basis. **Source:** Australian Bureau of Statistics

CHINA

PRODUCTION: Chemicals generally continue to score solid growth

Thousands of metric tons	1983	1982	1981	1980	Change 1982–83
Ammonia[a]	na	12,430	11,990	12,150	na
Fertilizer[b]	13,798	12,781	12,390	12,320	8%
Nitrogen (N)	11,094	10,219	9,860	9,990	9
Phosphate (P_2O_5)[c]	2,666	2,537	2,510	2,310	5
Potash (K_2O)	29	25	20	20	16
Sulfuric acid	8,700	8,170	7,810	7,640	6
Sodium hydroxide	2,123	2,073	1,923	1,923	2
Sodium carbonate	1,793	1,735	1,652	1,613	3
Calcium carbide	na	1670	1510	1520	10%
Plastics	1121	1003	916	898	12
Insecticides	331	457	484	537	−28
Ethylene	650	560	500	490	16
Synthetic detergents	677	569	478	393	19
Man-made fibers	541	517	527	450	5
Pharmaceuticals	48	42	37	40	14

a Nitrogen content of ammonia produced for fertilizer. b Nutrient content. c Including production of ground phosphate rock for direct application and phosphate animal feeds. **na** = not available. **Sources:** State Statistical Bureau of the People's Republic of China, Central Intelligence Agency

CHEMICAL IMPORTS: Fertilizers drop further

$ Millions[a]	1982	1981	1980	Change 1981–82
Fertilizers[b]	$ 534	$ 798	$ 969	−33%
Nitrogenous fertilizer	na	500	674	na
Chemical elements and compounds	456	476	536	−4
Organic chemicals	na	381	391	na
Plastic materials, resins	590	474	369	25
Dyeing, tanning, and coloring materials	125	109	79	15
Medicinal products	30	28	19	10
Essential oils, perfume, and cleansing materials	21	16	9	30
Other chemicals[c]	183	153	180	19
TOTAL	**$1940**	**$2054**	**$2162**	**−6%**

a Free on board. b Manufactured. c Includes explosives and pyrotechnic products; mineral tar and crude chemicals from coal, oil, and natural gas; and chemical materials and products not elsewhere specified. **na** = not available. **Source:** Central Intelligence Agency, estimated from data reported by China's trade partners

CHEMICAL EXPORTS: Moderately higher

$ Millions[a]	1982	1981	1980	Change 1981–82
Chemical elements and compounds	$ 595	$ 551	$ 478	8%
Organic chemicals	na	297	275	na
Medicinal products	204	190	184	7
Essential oils, perfume, and cleansing materials	107	89	98	20
Explosives and pyrotechnic products	112	93	94	20
Plastic materials, resins	46	61	73	−25
Dyeing, tanning, and coloring materials	72	62	58	17
Mineral tar and crude chemicals[b]	27	56	27	−51
Fertilizers[c]	6	5	4	11
Other chemical products	164	188	165	−13
TOTAL	**$1332**	**$1296**	**$1181**	**3%**

a Free on board. b From coal, oil, and natural gas. c Manufactured. **na** = not available. **Source:** Central Intelligence Agency, estimated from data reported by China's trade partners

TAIWAN

INDUSTRY TRENDS: Petrochemicals set pace

Industrial production indexes, 1981 = 100	1983	1982	1981	1980	Change 1982–83
All manufacturing	115.2	100.5	100.0	96.1	15%
Chemical materials	115.9	100.6	100.0	96.1	15
Basic chemicals	108.0	100.5	100.0	98.9	7
Petrochemicals	113.4	95.7	100.0	95.8	18
Fertilizers	74.0	72.8	100.0	106.1	2
Synthetic fibers	119.9	104.1	100.0	92.6	15
Plastics and resins	125.5	107.9	100.0	99.1	16
Chemical products	122.2	118.3	100.0	90.2	3

Source: Taiwan Ministry of Economic Affairs

FOREIGN TRADE: Chemical deficit expands

$ Millions	1983	1982	1981	1980
Exports[a]	$25,123	$22,204	$22,611	$19,811
Imports[b]	20,287	18,888	21,200	19,733
Trade balance	4,836	3,316	1,411	78
Chemical exports[a]	1,041	1,012	973	492
Chemical imports[b]	2,814	2,312	2,705	2,023
Chemical trade balance	−1,773	−1,299	−1,731	−1,530

a Free on board. b Includes cost, insurance, and freight. **Sources:** Taiwan Council for Economic Planning & Development, C&EN estimates

PRODUCTION: Major inorganics remain depressed

Thousands of metric tons, unless otherwise noted	1983	1982	1981	1980	Change 1982–83
Man-made fibers	840	730	687	633	15%
Sulfuric acid	678	685	819	769	−1
Polyvinyl chloride	522	459	456	454	14
Ethylene	499	452	443	458	10
Vinyl chloride	458	434	411	405	6
Ammonium sulfate	381	373	504	539	2
Ammonia, anhydrous	378	386	494	504	−2
Sodium hydroxide	295	359	373	411	−18
Xylene[a]	275	230	277	311	20
Compound fertilizer	275	247	330	343	11
Propylene	250	225	204	213	11
Hydrochloric acid	212	191	184	179	11
Benzene[a]	182	130	137	145	41
Urea	171	175	285	343	−3
Calcium superphosphate	159	160	226	207	−1
Ethylene glycol	151	120	156	133	26
Oxygen[b]	125	156	174	159	−20
Toluene[a]	115	113	172	153	2
Paints	108	97	84	79	10

a Millions of liters. b Millions of cubic meters. **Source:** Taiwan Ministry of Economic Affairs